AMERICAN
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Present-Day Competition

and the Textile Chemist

By B. A. HAROLD

NUMEROUS studies have been made by research in industries other than the textile industry in which textile products have been displaced by the results of these investigations. Some types of textile products have been displaced by textiles of different constructions. In each instance where there occurs a substitution of a certain textile construction, some manufacturer loses a lucrative outlet for one of his products. Credit must be given to the displacer whether he be a member of the textile or another industry, for creating this new outlet for his merchandise.

The importance of the chemist in as technical a field as textile processing has been made more pronounced in the last four years. With business competition being such that profits on standard products of a manufacturer becomes meagre, the margin of profit is largely governed by manufacturing efficiency. The chemical laboratory is a major executive branch of a manufacturer which can aid this efficiency.

The textile industry has introduced new developments such as the sanforizing process to the market; it has improved many of the properties of older items. In many of these developments textiles have been aided by sister industries such as the rubber and chemical industries. We refer to the marketing of guaranteed fast colors on garments as well as to the commercial utilization of the new rubber textile—lastex.

How can the average textile laboratory justify its indispensability as a vital portion of an organization? How much does a textile manufacturer seriously impair his profits by carrying a non-productive laboratory?

The writer, a textile chemist, has analyzed his own laboratory in the light of the above with the result that we will, in the following, attempt to outline (1) a resume of a general program confronting the average textile chemist, and (2) how the adherence to certain recommendations of this program should result in net profits for his organization.

The four major projects confronting the progressive textile laboratory may be outlined as follows:

1. Routine analysis.
2. Purchase recommendations.
3. Research and development work for the sales organization.
4. Plant research.

A quick perusal of these projects will at first tend to indicate that some of these are more important than others, but if each is analyzed individually it will be revealed that each has its niche of importance. Everyone of these sub-divisions should occupy the program of the textile laboratory which seeks to show profits.

I. ROUTINE ANALYSIS

It is interesting to note that the average routine textile methods of analysis require little elaborate chemical apparatus.

A great portion of the time spent in routine analysis is confined to checking of purchased material. These may be further sub-divided into the physical and chemical checking of (a) raw material of fibrous nature (cotton wool, silks, and rayons), (b) dyestuffs, (c) chemicals used in the plant processing.

One of the major expenditures in any textile plant is for raw material. Usually in purchasing this there are requisite specifications as to properties to be possessed by these raw materials. There are two methods by which a manufacturer can prove his raw material. One is through his laboratory, which is an inexpensive method, and the other is through placing the raw material into process without preliminary tests, risking difficulties in his processing which is a very expensive and tardisome method.

If the average one to two per cent of the raw material bought by a manufacturer during a year's time, which is

an average quantity, that might not be found up to standard, is prevented by the laboratory, the saving involved in dollars and cents can go a long way towards paying the expense of that laboratory for the year.

Let us cite the example of the textile manufacturer who purchases re-worked products such as shoddies and rayon wastes. The rayon wastes may be bought with the understanding that they contain only the regenerated rayons, free from any acetate silk. The troubles which can be encountered by the unknown presence of cellulose acetate with a rayon like "viscose" are well known. The dyer, ignorant of its presence, does not add the requisite dyes—the result, a finished product with undyed specks and streaks requiring reprocessing. Discrepancies of this type in the raw material can be thwarted by the competent laboratory which includes the routine analysis of all raw materials before their use.

The microscope is an instrument which should be of very material aid to any chemist who checks raw materials of a fibrous nature. It may be a means to distinguish the type of vegetable fiber which contaminates a shoddy woolen stock. It may serve as a means to identify specks and spots which might adulterate the raw material, which if not coped with, will show themselves in the finished material.

The textile chemical laboratory should work in close relationship with the dyer and his laboratory.

It is needless to state that the expenditures for dyestuffs by the average textile manufacturer, whose plant possesses a dyehouse is one of his major costs in the plant processing of his goods. Very akin to the raw materials, the efficient manufacturer is interested in the uniformity of the dyes which he is buying. This can be effected by laboratory checks on each shipment which he buys.

Not only does dyestuff checking protect the manufacturer, but also the dyer. Not all discrepancies in dye shipments are due to their weaknesses in strength when compared to the standard. Some colors often are standardized by a dye manufacturer on the strong side, and if the dyer is not warned his matching of shades is made more difficult by these strong colors offsetting his formulae, especially in light shades.

It is the duty of any able textile chemist to learn as much as possible of the art of dyeing. If this cannot be generalized practically, he should learn the methods of dyeing in the dyehouse of his own plant.

The main chemical laboratory which works in close contact with the dyer and dyehouse can be of fruitful assistance to the latter who often is too busy with the more practical end of the dyehouse, to investigate the more technical sides of his field.

The checking of the other chemicals used in plant processing may not be as important as dyestuff checking, but it should occupy its place in the curriculum of the routine analysis.

We might mention that there are numerous physical and chemical tests which must be conducted to note whether regular processed goods are meeting standard specifications. Regardless of the fact that a regular customer may not submit specifications on his material, it is the duty of the chemist to prepare a set of specifications from an accepted lot as a standard for subsequent lots.

II. PURCHASE RECOMMENDATIONS

Since there are numerous chemical houses as well as dyestuff manufacturers who compete for the business of the textile manufacturer, it, of course, falls to the lot of the laboratory to pass upon the qualifications of submitted products. Chemical companies through their development work are daily submitting samples of improved products. One might suggest, "Why the laboratory? Isn't the proof of a new processing agent in its effect on the finished product?"

With the tremendous number of competing products being submitted it would be almost impossible to try all of these in the plant. There is the expense caused by the interruption and slowing up of the regular routine procedure.

We might cite the example of the development of the sulfated alcohols. At present, there are probably six or seven products described by chemical manufacturers in this chemical family.

If a textile plant is using one of these processing agents, its use either as a detergent, softener, or dyeing assistant should be ascertained. A cheap and an efficient method for testing a newly submitted product sample is to test it in the light of its particular use in the plant. If these tests are encouraging, then steps for executing plant tests should be taken.

The proximity of the laboratory to the purchasing agent has become more pronounced. The latter should be aided by the chemist's training in purchasing more technical products. A goodly percentage of sales agents contacting the textile manufacturer today are not like the older salesmen—"hail and well met." This type has been displaced by the more technical sales engineer or demonstrator. These men must be met on their own ground; hence the need for his direct contact with the chemist.

III. SALES RESEARCH AND DEVELOPMENT

The most systematic method for developing new fields for products is a close contact between the man who develops and the man who contacts the consumer; i.e., between the chemist and the salesman, respectively. The salesman can always describe that which is lacking in the material which he is selling; why it cannot invade certain other fields for application. The chemist should attempt to alter his company's products so that a product might be produced which will satisfy his salesman and possibly open a new outlet. Meetings at least once a month between the sales organization and personnel of the laboratory should occupy the company's curriculum. It is surprising how rapidly suggestions become research proj-

ects, and research projects result in new outlets for merchandise.

There are two questions which should always face the textile laboratory: (1) Where can our materials be used where they are not being used at present, (2) What new recent technical developments can be applied to our products to create greater fields for them.

To answer these questions honestly, the chemist requires the aid of the current technical literature. Not only does the laboratory's library require the presence of the magazines, patents, and publications related directly to the textile field, but also those publications related to the major industries in which his company's products find use. This sphere should not be limited to American literature only, but should encompass descriptions of research executed on the continent.

It is the duty of the chemist who may be regarded as one of the most technical men in an organization to inform his sales organization of current technical developments. Once this information is imbedded in the mind of the salesman, he is equipped with another weapon which can be of use in helping his own customer who may require just this aid.

IV. THE CHEMIST IN IMPROVING PLANT PROCESSING

There are three angles from which each department of a textile plant should be regarded and handled:

1. Insurance of uniformity of the material through each department by chemical means.
2. Production of optimum results at a minimum chemical cost.
3. Utilization of the latest chemical developments for application in the respective departments.

The chemist in encountering plant work faces the psychological problem of keeping the foreman in a cooperative frame of mind when experimental work is being conducted in that foreman's department. There is much which the chemist can learn from the practical foreman. At all times the foreman should be made to feel that he is a partner rather than a spectator in the experimentation. In this state of mind the way is paved for possible improvement in plant processing by cooperation of the more practical foreman with the more theoretically inclined chemist.

It is almost needless to emphasize the suggestion that it is the duty of the chemist to closely check his laboratory experiments against mill procedure, and not blunder into the plant with a project which is impractical. An occurrence of this type causes a loss of confidence in the chemist by the mill owner as well as the foreman.

With the present competition on standard products being as acute as it is, profits on these to a manufacturer are dependent on volume of production and manufacturing efficiency. In other words, the margin of profit on this type of goods to the textile manufacturer as compared to his competitor is dependent on the profit realized within the plant. With the expenditures for labor standardized by the various codes, plant profit is therefore dependent on efficient methods of plant processing.

When the textile manufacturer aided by his chemical laboratory produces a new product or specialty, there vanishes the worry of meeting keen competition. The competition existent is that present in the new field which he is invading which is usually more specialized and consequently less competitive. Thus the new field open for profit to the textile manufacturer is that of so-called "specialties."

The chemist with his technical knowledge has assumed a niche of greater importance in textile processing because of the greater technicalities involved. Technological developments in textiles have by no means reached their end, but bid fair to become more numerous.

The efficient chemist has been of aid to the textile manufacturer in circumventing some worries in meeting keen competition, and the chemist is one of his tools for meeting that which the future market is seeking.

The textile manufacturer is strictly a business man who must realize profits in order to maintain a progressive plant. His laboratory's value to him is in direct proportion to its aid in developing and maintaining means of profit.

• CALEX CRYSTALS

Watson-Park Company, whose new offices are at 261 Franklin Street, Boston, Mass., announce that they have been made exclusive distributors in New England for the new product of Calgon, Inc., namely, Calgon Agglomerate. This will be marketed by the Watson-Park Company under the trade name of "Calex Crystals."

The new product is said to carry all of the worthwhile properties of Calgon, plus the distinct advantage of being readily soluble when stirred into cold water. Calex Crystals is in small pellet form and is said to be so readily soluble that it may be thrown dry in proper amounts into the washer effectively without previous dissolving. As an agent for hastening the freeing of soap during the rinsing operations, this product is said to be recognized as most effective. Insoluble sodium stearate is readily converted by Calex Crystals into the soluble sodium salts.

In the presence of hard water soap making, the dry crystals may be stirred into the soap batch and used in subsequent scouring operations. It may be added direct to the dye bath regardless of the class of dyestuff used and is claimed to be a highly effective leveling agent. It is stated that Calex Crystals will find an important place when used in the neutralizing of remaining aluminum salts after carbonizing.

To those mills who are unfamiliar with Calex Crystals, Watson-Park Company wishes to acquaint them through their practical service department and offer those plants who have not recently checked the quality of their water supply, a free water survey analysis.

● NEW PUMP

The American Hard Rubber Company offers its new type W A M pump and state that in their belief it is the finest in the non-metallic field of medium capacities up to 90 gallons per minute at 12 ft. head. Every feature of the design has been worked out carefully on the basis that ability to handle acids and corrosive chemicals without difficulty is the first requisite.

The casing of this pump is made of acid-resisting hard rubber and is also heat and distortion resisting. It is mounted to the base by means of acid-resisting hard rubber covered casting which acts as a chamber to catch drip from the stuffing box. By-pass is adjustable and cored right into back casing. The motor shaft is especially extended, tapered and pinned into the pump shaft with all parts interchangeable.

The manufacturer has prepared a folder which gives complete information, capacity chart, etc. This is available, with prices, to anyone interested. Write to the attention of chemical equipment sales division.

● GENERAL RELEASES

The General Dyestuff Corporation announces release of circulars on the following new products. Copies of these bulletins may be obtained on request.

Naphtol AS-L4G—which, with suitable Fast Color Salts is said to produce extremely bright greenish yellows of a fastness to light which is claimed to be even better than that of vat yellows; the combinations, it is stated, possess the feature of being white dischargeable.

Fastusol Orange F 3 G—a straight, direct color of a very bright yellowish orange shade, said to level well and to dye cotton and viscose the same shade and leave acetate clean.

Fastusol Yellow L 2 R A—a direct dyestuff said to have superior fastness to light, recommended by the manufacturers for dyeing rayon and cotton, and further claimed to be well suited for cotton-silk unions. It is stated that acetate is left white.

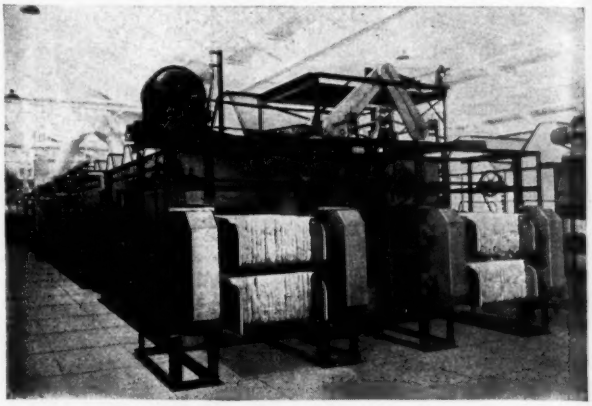
Fastusol Yellow L 5 G A—claimed to be the greenest and brightest shade of all direct dyeing colors and to have particularly good fastness to light. It is said to be well suited for cotton-silk unions. It is further said that acetate is left white.

● CORROSION-PROOF DRYERS

The Philadelphia Drying Machinery Co. announces production of a new corrosion proof dryer. The company states that during all stages of rayon manufacture, corrosion prevention is a very important factor and it has been the subject of much study and work to determine the best method of preventing contamination of product.

Iron or rust particles of very small dimensions, if allowed to come in contact with the wet material, produce spots on the material which make it unfit for use, or, at best, put the product in a lower quality group.

The drying itself, often under conditions of high controlled humidity, is said to produce an atmosphere which is extremely hard on steel dryer constructions commonly employed for ordinary drying.



Aluminum heating coils are used in this new dryer and it is said that this proved of great advantage because it eliminated one large source of contamination from rust particles, in addition to providing better heat transfer due to the high conductivity of the aluminum.

Structural aluminum is used throughout for the frame, making a lightweight structure. Aluminum sheets are used for all internal partitions, as well as for the inside sheets of all insulating panels. Steam coils and coil supports are also of aluminum construction. Aluminum bolts are used to assemble the framework. All surfaces which come in contact with the recirculated, heated and humid air are of aluminum or aluminum alloy construction. In selecting the alloys of aluminum for this purpose, care was exercised to use alloys free from copper, as it is claimed these alloys had previously been proven unsatisfactory.

Naturally, this construction is considerably more expensive, but the added cost is said to be justified in lower maintenance costs and freedom from corrosion, longer machine life, and entire elimination of the possibility of contamination of product.

Sulfur Dyestuffs

German Patent No. 474,786 (9/IV/'29)—*Gesells. f. Chem. Ind. in Basel.*—When the leuco-derivatives of the indophenols from carbazole and nitrosophenols are sulfurized with alkali sulfides and sulfur, valuable dyestuffs are produced, but the reaction for best results must be carried out at comparatively low temperatures, in the presence of alcohol as a medium or solvent. In this case, the reaction is carried out in the absence of alcohol or other media, in the presence of benzidine, the reaction proceeding rapidly, and the yields being high. The products are indigo-blues with a greenish cast, and can be applied from either sodium sulfide or hydrosulfite vats. Four examples are given.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

FEBRUARY 25, 1935

Officers of the Association

ROBERT E. ROSE, *President*
E. I. Du Pont de Nemours & Co., Wilmington, Del.

A. R. THOMPSON, Jr.—WILLIAM H. CADY, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline & Chemical Co., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

LOUIS A. OLNEY,
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

Councilors-at-Large

JOSEPH F. X. HAROLD — WILLIAM D. APPEL
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CARL Z. DRAVES — HENRY F. HERRMANN

Councilors Representing Sections

HEYWARD F. LAWTON (Rhode Island) — EUGENE C. KNAEBLE (Philadelphia)
HANS MEYER (New York) — CARL E. BICK (Midwest)
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New York Section
Ephraim Freedman, Chairman, Bureau of Standards, R. H. Macy & Co., Broadway and 34th St., New York, N. Y.
P. J. Kennedy, Secretary, E. I. duPont deNemours & Co., Inc., 61 Thomas St., New York, N. Y.

Philadelphia Section
Robert A. Bruce, 945 Herbert St., Philadelphia, Pa.
Charles A. Seibert, Secretary, 39 Chestnut St., Salem, N. J.

Piedmont Section
Paul Haddock, Chairman, P. O. Box 1888, Charlotte, N. C.
T. R. Smith, Secretary, Piedmont Processing Co., Belmont, N. C.

South Central Section
Harold Schroeder, Chairman, Dixie Mercerizing Co., Chattanooga, Tenn.
Harvie Bruce Kimbell, Secretary, Dixie Mercerizing Co., Chattanooga, Tenn.

Midwest Section
Arthur T. Brainerd, Chairman, Ciba Co., 325 W. Huron St., Chicago, Ill.
Elias A. Johnson, Secretary, National Aniline & Chemical Co., 357 W. Erie St., Chicago, Ill.

South-Eastern Section
Charles B. Ordway, Chairman, Alabama Polytechnic Institute, Auburn, Ala.
C. A. Jones, Secretary, Georgia School of Technology, Atlanta, Ga.

Lowell Textile Institute Student Section
Kenneth E. Leslie, Chairman; Chester M. Kopatch, Secretary

North Carolina State College Student Section
E. F. Anderson, Chairman; A. E. Shumate, Secretary.

Members should notify the **Secretary** immediately of all address changes

Annual Business Meeting*

President Rose: Gentlemen, I will call to order the business meeting of the Association.

We will have, first, the report of the tellers who counted the ballots. That will be presented by Mr. Knaeble.

Mr. Eugene C. Knaeble: Mr. Chairman and Gentlemen: I will report the result of the balloting:

Ballots cast—346.

Included in these 346 were 4 blanks.

The votes were cast as follows:

For President—Robert E. Rose	.....	340
	Arthur Thompson, Jr	 1
For Vice-Presidents:		
	Arthur Thompson, Jr	 333
	William H. Cady	 338
	H. N. Chase	 1
	C. E. Mullin	 1
	Harold Schroeder	 1
For Treasurer—William R. Moorhouse	.....	340
For Secretary—Harold C. Chapin	.....	341
For Councilors at Large:		
	Carl Z. Draves	 341
	Henry F. Herrmann	 333
	Hill Hunter	 1
	P. J. Kennedy	 1

And one ballot has been cast for a non-member.

President Rose: You have heard the result of the ballot. We will declare the choice of the Association as elected for the ensuing year.

Has the Secretary a report to give us at this time?

SECRETARY'S REPORT—OCTOBER 31, 1934

The 1929 Year Book of this Association, a volume of 354 pages, lists for October of that year, 1154 members of

*December 8th, 1934, New York, N. Y.

all classifications. Our fifth subsequent volume contains 474 pages and is therefore about one-third greater.

With all our ups and downs during the depression, our numbers have never dropped below those of 1929, and on November first, at the beginning of this fiscal year, were back at a maximum of 1324, showing a net gain of 15 per cent over the five years. The trend is still upward. Paid applications received since November first are over double those received in the corresponding period a year ago; and renewal dues are over 25 per cent ahead.

Not including these recent additions, our membership on November first was as classified below:

	Active	Junior	Assoc.	Student	Total
N. N. E.	209	30	8	0	247
R. I.	163	16	10	0	189
N. Y.	272	25	19	0	316
PHIL.	169	17	16	2	204
PIED.	88	10	12	1	111
S. CL.	30	4	4	1	39
S. E.	26	1	7	4	38
M. W.	87	5	8	0	100
L. T. I.	0	0	0	18	18
N. C.	0	0	0	4	4
Unclassified	28	2	3	0	33
Total	1,072	110	87	30	1,299
Corporate					25
Grand Total					1,324

Council meetings 92 to 97 and Research Committee Meetings 85 to 90, reported in detail in the American Dyestuff Reporter, were as follows:

New York, December 8, 1933.
Providence, January 26, 1934.
Washington, March 23, 1934.
New York, May 11, 1934.
Boston, June 15, 1934.
Boston, October 19, 1934.

Respectfully submitted,

H. C. CHAPIN, *Secretary.*

President Rose: Gentlemen, you have heard the report of the Secretary. What is your pleasure?

. . . It was moved and seconded that it be accepted. . . .

President Rose: It has been moved that the report of the Secretary be accepted as read. If there are no objections, it will be so recorded.

Mr. Treasurer, have you a report?

Treasurer Moorhouse: Mr. President, with your permission, I won't read all the figures. The report will be published later. I will just bring out that with certain adjustments, we are about $2,000 better off than we were a year ago.

The first figure shows a little less, but we had a check come in from the Textile Foundation two days after the closing of the books, which brings it up all right. Our cash balance with that adjustment on October 31 was approximately $11,000, a little over $11,000.

TREASURER'S REPORT—OCTOBER 31, 1934

General Fund

Cash on hand—November 1, 1933		$7,396.62
Receipts—November 1, 1933 to October 31, 1934		
From Secretaries		
A. N. Graves	$2,997.08	
H. C. Chapin	4,194.74	
From Members	10.00	
Interest on Savings	136.40	7,338.22
		$14,734.84
Expenditures—November 1, 1933 to October 31, 1934	$5,595.21	
Transferred to Research Mar. 23, 1934	2,000.00	7,595.21
Balance October 31, 1934		$7,139.63

Research Fund

Cash on hand—November 1, 1933		$1,617.98
Receipts—November 1, 1933 to October 31, 1934		
From Secretaries		
A. N. Graves	$1,530.00	
H. C. Chapin	209.00	
From Textile Foundation	6,200.00	
Transferred from General Fund, March 23, 1934	2,000.00	9,939.00
		$11,556.98
Expenditures—November 1, 1933 to October 31, 1934		10,060.39
Balance—October 31, 1934		$1,496.59

Bank Balance—October 31, 1934

General Fund	$7,139.63
Research Fund	1,496.59
	$8,636.22
First National Bank—Savings Account	$5,672.83
First National Bank—Checking Account	2,963.39
	$8,636.22

Statement of Cash Position:

	General	Research	Total
Cash on hand—November 1, 1933	$7,396.62	$1,617.98	$9,014.60

Cash on hand—October 31, 1934	7,139.63	1,496.59	8,636.22

Remarks: Under date of November 1, 1934, and after our books were closed for the fiscal year ending 10/31/34, I received a check from the Textile Foundation amounting to $2,025.00. Also, on November 7, 1934 our Secretary transmitted the balance of all funds he received during fiscal period not previously sent me. This check amounted to $415.53.

If the Textile Foundation check and the Secretary's payment received just after closing of the books 10/31/34 were included in the cash balance as of 10/31/34 our Cash Position would be as follows:

General Fund	$7,555.16
Research Fund	3,521.59
Total	$11,076.75

Comparison of Actual Receipts and Expenditures Totals for Years Ending October 31, 1933 and October 31, 1934

General Fund

	Year Ending Oct. 31, 1933	Year Ending Oct. 31, 1934
Total Receipts	$6,402.08	$7,338.22
Total Expenditures	5,402.66	5,595.21
Surplus	$999.42	$1,743.01

Additional Receipts for fiscal year ending Oct. 31, 1933 but transmitted to Treasurer by Secretary after November 1, 1933 and included in Receipts for fiscal year ending October 31, 1934..... $593.29

Additional Receipts for fiscal year ending Oct. 31, 1934 but transmitted to Treasurer by Secretary after November 1, 1934 and not included in Receipts for fiscal year ending October 31, 1934..... $415.53

Adjusted Surplus	Year Ending Oct. 31, 1933	Year Ending Oct. 31, 1934
As reported above.....	$999.42	$1,743.01
Additional Receipts Oct. 31, 1933	593.29	Deduct 593.29
		$1,149.72
Additional Receipts Oct. 31, 1934	.....	415.53
Adjusted Surplus	$1,592.71	$1,565.25

Research Fund

	Year Ending Oct. 31, 1933	Year Ending Oct. 31, 1934
Total Receipts	$9,322.33	$7,939.00
Total Expenditures	9,806.17	10,060.39
Deficit	$483.84	$2,121.39

The excess of Research Fund Receipts for year ending Oct. 31, 1933 over year ending Oct. 31, 1934 is due to our receiving four checks in the previous period from the Textile Foundation which totaled $7,700.00 against three checks received this fiscal year totaling $6,200.00 or a difference of $1,500.00.

Under date of November 1, 1934 a check for $2,025.00 was received from the Textile Foundation which will more than offset this difference. If this check for $2,025.00 was applied to the Deficit for fiscal year ending Oct. 31, 1934 the adjusted deficit would be $96.39.

Respectfully submitted,

W. R. MOORHOUSE, *Treasurer.*

President Rose: I think that it is a very satisfactory report for any Association such as ours at a time such as this, and I think we can all be congratulated on the status of the Association.

Are there any comments on the Treasurer's report? Is there a motion to accept it?

. . . It was moved that it be accepted, and the motion was seconded. . . .

President Rose: It is moved and seconded that this report be accepted as it will appear in the proceedings. If there are no comments, we will proceed in that way.

The next item of business is what, Mr. Secretary?

Secretary Chapin: Changes in the constitution.

President Rose: We have two proposed amendments to the constitution. In the first place, Article III, Membership, insert between paragraphs 1 and 2, this paragraph: "The Council may at its discretion elect as active members those, not qualifying under paragraph 1, who have had satisfactory training in science."

Shall we take the other amendment first, and then vote on them together?

Article VI, Dues—delete last sentence in paragraph one, now reading, "If, however, a member is elected on or after September 1, no dues shall be required for the current year."

These are the proposed amendments, and it is up to us to take action.

Mr. Moorhouse: Mr. President, I would say as to that second one, that what we are trying to cover is that, as it stands now, people apply during the summer and get the publications, and are not elected until after September 1. They really don't have to pay for them. They would, under the amendment.

Dr. Walter M. Scott: I move that these amendments be passed to letter ballot.

Mr. Thompson: I would like to ask one question. Does that mean an applicant signing an application blank in the middle of the summer will have to pay a full year's membership dues for half a year?

Mr. Moorhouse: Not unless he takes the publications and the Year Book.

Mr. Thompson: He can be elected without getting the magazine until the—

Mr. Moorhouse: He wouldn't be elected until after September anyway, as there would be no meeting of the Council until then.

Mr. Thompson: But he would have to pay the full year's dues from September to November?

Mr. Moorhouse: If he had the publication, which is good management.

Mr. Thompson: That is going to stem the tide of any more applications coming in at that time, because they won't do that.

Mr. Moorhouse: Oh, yes. We had a lot do that this year.

Secretary Chapin: I might say in explanation of that, that this question arose about the first of July. We wrote to all applicants who sent in their applications subsequent to July 1, and gave them their choice of receiving all privileges of membership, according to the constitution, from the time they were elected, which might be September but which chanced to be October 19; or of letting their $5 be counted toward 1934 dues, in order that they might receive the Dyestuff Reporter and the Year Book from date of application. The majority of those written to, by far the majority, elected to avail themselves of the second alternative. It was on the strength of that that this amendment was proposed.

In the future, as I understand it under the amendment, if an elected member does not care to receive the publications or have his dues counted for the partially elapsed fiscal year, then he can elect to assume membership and receive publications from the beginning of the new fiscal year.

President Rose: There is a motion but no second.

. . . The motion was duly seconded. . . .

President Rose: It has been moved and seconded that the proposed amendments be submitted by letter ballot to the membership. Is there any further discussion?

Mr. Clarence L. Nutting: Mr. Chairman, in connection with that membership question, would it be wise to suggest a sticker to put on the application blank, so that a person making application could signify at that time just what he wanted, because I know it would leave it ambiguous as it is now? Anyone making application would have to have some correspondence with the Secretary or with the Local Secretary to get things straightened out the way he wants them.

Secretary Chapin: I think that is an interesting suggestion, something for the Secretary to decide as a matter of administration. I will be very glad to talk it over with you and see if something can be worked out.

President Rose: Is there any further discussion? If not will all those in favor of the motion signify by saying "Aye." Contrary-minded? It is carried.

As far as I know, there are no Committees ready to report at this time, other than the Research Committee, and I will call on the Chairman of the Research Committee for his report. Dr. Olney.

REPORT OF RESEARCH COMMITTEE

Prof. Louis A. Olney: Since the last annual meeting, six research committee meetings have been held as follows: January 26, Providence, R. I.; March 23, Washington, D. C.; May 11, New York City; June 15, Boston; October 19, Boston; and New York, Dec. 7, yesterday here in the hotel. This last was the ninety-first regular meeting of the Committee.

During the year, there have been three new Sub-Committees organized: the first, the Sub-Committee on Mercerization of which Prof. Charles B. Ordway is chairman; the second, on the Determination of Oil, Soap and Other Extraneous Matter in Textile Materials, of which Mr. Hugh Christison is chairman, and a third on the Determination of Fibers in Mixtures, of which Mr. Claxton Monro is chairman.

Through a custom which dates back to our early annual meetings, we have at this time usually called upon all of the Sub-Committees of the Research Committee for a report. With twenty-four sub-committees actively functioning that seems like a rather extended proposition. A number of the chairmen are not here, but we will give all of the sub-committee chairmen who may be present an opportunity to report at this time.

It is important to have the reports of these sub-committees recorded in the Proceedings, but what is still more important is to have the reports in the 1934 Year Book when that is published later on. It should be understood that if the reports are not in the proper form at the present time, they should be put into final shape for publication within the next two or three weeks and forwarded to the chairman of the Committee.

If the reports that you have are not too long, they might well be presented in full at this time; that is, if they require only a very few minutes. On the other hand, if a report is too long, it would be well to present merely an abstract of what the report will be, when it is completed.

I will call for these reports in the order that the committees are listed in the Year Book:

Sub-Committee on Research Program

The first sub-committee is that of Research Program of which I am chairman. The Committee on Research Program has held three meetings. The function of this Committee is to maintain an adequate research program, and plan for its future extension. Its most important

work is the general planning and supervision of work being done under grants from the Textile Foundation. This committee at the present time is made up of a number of the key men in research work, and includes the chairmen of what we designate as Advisory Committees.

Each research project which is being carried on under grants from the Textile Foundation is guided by a Supervisory Committee. These Committees of which there are three, are working out very well indeed, and the chairmen constitute, as you might say, ex-officio members of the General Research Program Committee.

We have three full time research associates working at the present time, on problems which have been financed by the Textile Foundation; Dr. Harris, working on the Action of Alkalies on Wool, under an advisory committee of which Mr. Alban Eavenson is chairman, Dr. Glarum on the subject of Textile Printing Pastes under an advisory committee of which Mr. Wm. H. Cady is chairman and Mr. Ryberg, working on the Carbonization of Wool under a committee of which Mr. Roland E. Derby is chairman. Each of these three committees will render separate reports later.

Prof. Olney:

Sub-Committee on Fastness Tests for Dyed Silk

Dr. Walter M. Scott: This particular Committee has not done any active work during the past year, so it has nothing special to report, except possibly to note the action that was taken at the Research Committee Meeting yesterday, with the concurrence of the Silk Committee, which provides that he will alter the numerical designation of the standards of fastness so that number one will be the lowest in the scale, and that it will go on up in that way, instead of having number one the highest in the scale.

This action was taken to make our records correspond more to the records and standards of our own Light Committee, and also of the fastness committees of other associations, notably the English Association of Dyers and Colorists.

This change will be taken care of and probably will appear in the next Year Book.

Prof. Olney:

Sub-Committee on Fastness Tests for Dyed Wool

Mr. Hugh Christison: The committee with the help of our Research Associate, Mr. Ryberg at the Lowell Textile Institute, has made hundreds of dyeings in order to satisfy the ideal set up by the Research Committee as a whole in providing standards that would show a greater loss in depth with a proportionate staining of other fibers. We have not been completely successful as yet, but expect to bring these tests to a conclusion soon.

Prof. Olney:

Sub-Committee on Fastness Tests for Dyed Cotton

Mr. George A. Moran: There is very little to report for this particular committee.

There has been no change made in the standard methods, and only a rewriting of the older Methods to make them conform more closely with the standard methods. In the recent past, the Society of Dyers and Colourists has published standard methods for washing of cotton goods, which differ somewhat in detail from those of our Society. These will be compared in the near future to arrive at a determination as to whether these changes are of any advantage, and whether there can be changes made to bring the two sets of washing tests more closely into conformity.

That is all we have to report.

Professor Olney:

Sub-Committee on Light Fastness

Mr. Wm. H. Cady: This report is too long to read at this time, but it refers to three projects which the Committee has been working on. The first section takes up the situation in regard to standards of light fastness in Germany, England and this country. The second section deals with the work which this Commitee has been doing in comparing various fading lamps with the sun. Part of that work was published in the DYESTUFF REPORTER last month. The third section refers to the effect of different intensities of light on the relative fastness of dyes. Those who were here this morning no doubt heard Mr. Appel speak about the work that has been done on that subject.

Standards of Light Fastness. During the year sun and lamp exposures were conducted at Washington in an attempt to improve the standards of light fastness tentatively adopted by the Committee in 1931 and published in the Year Books of 1931 and 1933. While some progress was made it is evident that further work will be necessary, and it is expected that additional exposures will be made during the coming year. The situation regarding standards is complicated at present by the fact that during the summer the Society of Dyers and Colourists in England published an account of its own work on light standards, which resulted in the adoption of two sets of acid dyes, one composed of seven reds and the other of seven blues, as official British standards of light fastness. Incidentally, these dyes are materially different from our tentative standards and from the dyes adopted as standards by the Germans in 1932.

Our committee will test the British standards by exposing them to the sun and the Fadeometer during the coming year. Our tests of the German standards have already been completed, and a brief report of our findings was published in the 1933 Year Book. On the whole, these latest German standards are a decided improvement over their earlier offerings, and would appear to be quite well selected with the exception of Types 7 and 8, representing the highest degrees of fastness, which fade in an unsatisfactory way. We are still searching for a better "top standard," which can be dyed on wool by a simple

process, easily duplicated, and will have not only the necessary fastness in both sun and lamp but also the property of fading definitely lighter when it does finally fade, instead of merely becoming duller on prolonged exposure, like most of the extremely fast dyes. Without this property it would be useless as a "'yardstick" for measuring the fastness of other dyes. Suggestions will be welcome, and the committee will be glad to furnish complete details of its work to those who are interested.

Artificial Light Tests. After several years of effort in comparing sun fading with that produced by various arc lamps, your committee published its report in the AMERICAN DYESTUFF REPORTER of Nov. 5, 1934. In this report a comparison is made of the Fadeometer, Type C, made by the Atlas Electric Devices Co. (a lamp which has been in general use for several years); the Fadeometer, Type FDA, which is a more recent model produced by the same company; the Fugitometer, a lamp sponsored by the British Wool Industries Research Association; and a modified Fugitometer, developed by the Ontario Research Foundation of Toronto, Canada. After carefully studying the relative fading produced by these four lamps and the sun on forty selected dyeings, including a number which have a tendency to fade abnormally in artificial light, the committee has concluded that there is little to choose between the new Fadeometer and the modified Fugitometer, which are distinctly superior to the other two lamps and are probably the best fading devices available at the present time, from the standpoints of convenience, uniformity, and reasonable similarity to the sun in their action on dyes. Both lamps make use of the carbon arc, and as the spectrum on this arc is considerably different from that of average sunlight, it is only natural that there should be a certain amount of difference in the quality of the fading produced by the arc compared with that produced by the sun. If further improvements are to be made in fading lamps, probably a different source of light will have to be employed.

The Effect of Different Intensities of Light on the Relative Fastness of Dyes. During the past year, under the direction of Mr. Appel at the Bureau of Standards, a study has been made of the relation between intensity of radiation and the rate of fading of seven representative dyeings. Some quantitative data on the effect of humidity on fading was also obtained. The results have a direct bearing on the interpretation of tests made with the Fadeometer and other intense sources of light, since much lower light intensities prevail under many of the conditions of use to which textiles are subjected. A report of these tests will be published in the AMERICAN DYESTUFF REPORTER in the near future.

WILLIAM H. CADY, *Chairman.*

Prof. Olney:

Sub-Committee on Fastness to Perspiration

Mr. Hugh Christison: That Committee feels that they have gone about as far as they can for the present. It isn't because we believe the work is perfect, because it is not, but there is no active work being done. There has been no serious criticism of the tests as we now have them, and until there is some criticism of the tests, and until there is some work that can be done which may be more constructive, I don't think that any further work is necessary.

Professor Olney: Is there anything that might be done in the way of studying the recently published British tests on fastness to perspiration, along similar lines to those suggested by Mr. Moran?

Mr. Christison: Yes, there certainly is, and I think we can study our own methods in a rather critical way.

For instance, I feel sure that the tests as we now have them, and as they are now written in our Year Book do not indicate to the industry whether the material is fast to perspiration or not. The reason is that the mill men would make the tests more severe, and I believe that the dyestuff industry would rather have them less severe.

From a practical point of view, the mill man knows from years of experience, without any tests, what class of dyestuffs he must use. In the case of wool, he feels that he must use the chrome dyestuffs, as a rule, with perhaps the vats or the indigo salts, or something of that kind. I rather feel that the cotton people, if they had to guarantee and stand back of their product, would have to confine themselves to correspondingly fast dyestuffs such as the vat dyestuffs and the sulphur dyestuffs, and perhaps some of the naphthols, and dyes like that.

Professor Olney:

Sub-Committee on Fastness to Crocking and Stoving

Dr. Hans Meyer: There is no report.

Prof. Olney:

Sub-Committee on Fastness to Acids and Alkalis

Mr. Wm. R. Moorhouse: No report.

Prof. Olney:

Sub-Committee on Bibliography of Textile Chemistry, Bleaching, Dyeing and Finishing

Prof. Olney: I will say for that Committee that naturally there is no report at the present time because they wish to have the bibliography as complete and up to date as possible when it is eventually published in the Year Book.

Prof. Olney:

Sub-Committee on Waterproofness of Fabrics

Dr. Jos. F. X. Harold: I have nothing new to report.

Prof. Olney:

Sub-Committee on Testing the Suitability of Fabrics for Rubberizing

Prof. Olney: In the absence of Dr. Rupp would Dr. Scott care to say anything about the work of that Committee? Dr. Scott was added to this Committee yesterday.

Dr. Scott: I might just say that that Committee is

cooperating with a similar committee of the ASTM in trying to work out more accurate methods for determining still smaller amounts of copper. They are planning to investigate some of the newer reagents that have been proposed for determining minute quantities of copper, and apply those methods to the determination of copper in textiles.

Prof. Olney:

Sub-Committee on Color Standardization

Dr. Scott: I have nothing to report.

Prof. Olney:

Sub-Committee on Standard Methods of Determining Sizing, Weighting and Finishing Materials in Textiles

Prof. Olney: Mr. Hook the chairman of that Committee is absent but has sent the following statement to me; "We expect to submit a tentative method for the direct determination of starch in textile materials. We will also probably make a further study of the methods for more accurate determination of the amount of oils, fats, waxes, softeners and lime soaps in textile materials."

Prof. Olney:

Sub-Committee on Methods of Determining Oil, Soap and Other Extraneous Matter in Textile Materials

Mr. Christison: This committee in the last few months has done considerable work in connection with the U. S. Testing Company on methods for determining oil in wool, and, after conferences submitted a method to the Code authorities in charge of top and yarn. We have been notified that our recommendation has been adopted as official and a copy of this method now officially accepted is herewith submitted.

Extraction Method for Determining Oils and Fats in Worsted Top and Wool and Worsted Yarns

Sample—At least one sample, approximately 40 grams, shall be taken from each 1,000 pounds or less of a lot. It shall be selected at random from various places in the lot in such a manner as to be representative of the entire lot. The composite sample shall be divided into two samples of approximately 20 grams each.

Extraction—Each 20-gram sample shall be placed in the upper part of a Soxhlet extraction apparatus (see note below), in the bottom of which a thin layer of cotton, previously extracted with carbon tetrachloride, has been lightly placed as a filler, covering the opening of the syphon tube. The sample shall be extracted with (A. R.) carbon tetrachloride for two hours.

The rate of boiling shall be so regulated that the extraction chamber empties once each 10 minutes, and not less than 5 times per hour. The distillation flask shall be detached from the extractor attached to a separate Liebig condenser and the contents evaporated to near dryness, recovering the condensate in a separate flask.

Rinse the extract and residual solvent from the flask into a tared beaker and gently drive off the carbon tetrachloride on a heated water bath. Finish drying, to constant weight, by setting in an oven at 100°C. Cool beaker in a desiccator to room temperature. Weigh residue carefully to the nearest milligram.

Dry the extracted sample of top or yarn to constant weight in a ventilated drying oven at 110°C. ± 2°, and weigh in oven to the nearest centigram.

Calculation—Add to the dry weight of extracted sample, the weight of the extracted residue and to this sum add the Standard Regain for the top or yarn. This gives the Standard Weight of the sample.

The average of the two extractions shall be taken as the oil and grease contest of the materials.

Illustration of Calculation:

Let weight of dry extracted sample = 19.121 grams
Let weight of extract residue..... = 0.412 grams
Let Standard Regain ..... = 15% (or 0.15)
Then the percentage oil =

$$\frac{0.412 \times 100}{(19.121 + .412) \times (1 + 0.15)} = 1.83\%$$

NOTE:—A recommended form of Soxhlet Apparatus for this work consists of a soxhlet tube with an inside diameter of 50 mm. an approximate capacity to the top of syphon of 200 cc., and a syphon tube of about 4 mm. internal diameter. This is attached to an Allihn condenser, ground glass joints being used throughout.

Prof. Olney:

Sub-Committee on the Determination of Fibers in Mixtures

Prof. Olney: Mr. Monro is absent but sends this statement, "The Committee on the Determination of Textile Fibers can report progress. The investigations of the several phases of this work are getting started, and we hope after the first of the year it may be possible to take advantage of the appropriation and arrange for a full time operator in order to expedite the matter as much as possible."

Prof. Olney:

Sub-Committee on Shrinkage of Textiles

Mr. Howard D. Clayton: I have nothing new to report.

Prof. Olney:

Sub-Committee on Material for Construction of Dyeing and Finishing Machinery

Mr. Harold W. Leitch: There is nothing new to report.

Prof. Olney:

Sub-Committee on Wetting Out Materials

Dr. Carl Z. Draves: I have nothing new.

Prof. Olney:

Sub-Committee on Methods of Analysis and Standardization of Sulfonated Oils

Prof. Olney: I don't see Mr. Hart here, but I am quite sure that he plans to have a complete report ready in time for the Year Book.

Prof. Olney:

Sub-Committee on Textile Printing Pastes

Mr. Wm. H. Cady: I have a report covering the work of our research associate, Dr. Glarum. It is quite brief, but I suggest that without reading you print it as it stands.

Report of the Advisory Committee on Printing Pastes

This committee was appointed in the spring of 1933 to act in an advisory capacity in connection with Project 6-33, entitled "A Fundamental Study of Vat Printing Pastes", which was made possible by an allocation from the Textile Foundation in Washington.

Our Research Associate, Dr. Sivert N. Glarum, who is working on this project at Brown University, published a preliminary report of his work in the American Dyestuff Reporter of March 26, 1934. In this report, after defining his problem and referring briefly to some of the earlier work which had been done along similar lines by other investigators, Dr. Glarum described his attempts to measure the physical characteristics of printing pastes, and in particular, his experiences with various types of viscometer. Since that time he has made a special investigation of gum tragacanth pastes, and has studied the effect of varying such important factors as the time of soaking and of cooking on the resultant viscosity, and the changes produced by traces of acids, salts or alkalies. This work will be gradually extended to include all of the important vat thickenings.

Dr. Glarum has also experimented with various devices for determining the pH of pastes, including both colorimetric and electrometric apparatus. With regard to the latter, after trying antimony, quinhydrone and glass electrodes he found the last mentioned to be the only one which was satisfactory for use with the materials of which printing pastes are made.

Through the courtesy of the DuPont Company, the committee has secured the use of a small printing machine, which has been recently installed in Dr. Glarum's laboratory, and will be of great assistance in correlating the viscometric and other physical data now being obtained from printing pastes, and the actual printing qualities of these same pastes.

The committee and Dr. Glarum would be very glad to hear from those who are interested in the vat printing paste problem, and who have any suggestions for the further extension of this project.

WILLIAM H. CADY, *Chairman.*

Prof. Olney:

Sub-Committee on Carbonization of Wool

Mr. Roland E. Derby: The work on carbonizing has gone forward this year at Lowell Textile Institute, and has been carried out by Mr. Ryberg. The results of his work, I believe, are going to be presented at the meeting this afternoon.

The Committee has had two meetings at which time we offered suggestions to direct Mr. Ryberg's work, and we have made arrangements for him to visit mills to obtain practical knowledge of how the process of aluminum chloride carbonizing is carried on commercially.

Prof. Olney:

Sub-Committee on the Effect of Alkalies on Wool

Prof. Olney: Mr. Alban Eavenson the Chairman of this sub-committee was present yesterday but unable to attend the meeting this afternoon. The report of this committee will be published in full later on.

Prof. Olney:

Sub-Committee on Mercerization

Prof. Olney: Is Professor Ordway here? (Not present).

Professor Olney: That concludes the reports of all the Sub-Committees, and as far as I can see, Mr. Chairman, that completes the program.

President Rose: Has anybody any other business to bring up before the business meeting?

I should like to say something, since we are sort of among ourselves here, and that is, that the national officers—I am speaking for all of them—feel very deeply indebted to the officers of the Local Section, for the extremely efficient and brilliant arrangement of the program that we are in the process of enjoying now—Mr. Freedman and Mr. Herrmann, particularly, and the chairmen of their subcommittees. (Applause).

We appreciate what they have done.

If there is no other business, a motion to adjourn is in order.

. . . The meeting thereupon adjourned at one o'clock. . .

CALENDAR OF COMING EVENTS

MEETING, PHILADELPHIA SECTION, FRIDAY, MARCH 8th, BROADWOOD HOTEL, PHILADELPHIA.

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MEETING, NEW YORK SECTION, FRIDAY, MARCH 1st, ALEXANDER HAMILTON HOTEL, PATERSON, N. J.

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MEETING, COUNCIL AND RESEARCH COMMITTEE, MARCH 1st, NEW YORK CITY.

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MEETING, SOUTHEASTERN SECTION, MARCH 2nd, RALSTON HOTEL, COLUMBUS, GEORGIA.

SATURDAY AFTERNOON SESSION

(*Fourteenth Annual Meeting*)

December 8, 1934

The meeting convened at two o'clock, President Rose presiding.

President Rose: The meeting will please come to order.

We are keeping so closely to the schedule that we are getting a little head of the speakers. The first paper of the afternoon is one on the "Quantitative Analysis of Fiber Mixtures," by R. T. Mease of the United States Bureau of Standards. Mr. Mease could not be here and the paper is to be read by William D. Appel who I am informed is on his way and will be here in a few minutes.

In the meantime, if anybody has any subject he would like to bring up for discussion, while we are waiting, we will be glad to hear from him.

Mr. Himmelfarb, of the New York State Department of Labor, has kindly consented to say a few words about the use of fluorescence in distinguishing between different types and ages of cotton.

Mr. Himmelfarb! (Applause.)

Mr. David Himmelfarb: I had absolutely no intention of coming up here to make a speech today but Mr. Freedman asked me if I would say a few words apropos of a discussion of fluorescence. This morning one of the speakers gave a short talk on fluorescence.

The laboratory of the Bedding Division of the Department of Labor of the State of New York is using it mainly in testing the material used in the making of mattresses, particularly cotton felts and cotton fibers, to determine whether they are second hand or new. Several years ago THE AMERICAN DYESTUFF REPORTER had an article that showed that the fluorescence of second hand and new cotton was different. The new cotton would have a purplish fluorescence while the second hand material had an ivory-black.

This work has been developed in our laboratory in order to make sure that all the mattresses sold in the State of New York are properly designated and that when the tag calls for new material, it shall be actually new material, because there has been a practice of using second hand material and we are using the ultra-violet fluorescence as a principal test in the prosecution of such cases. We are also using the ultra-violet test to distinguish between different kinds of wools. Wool felts containing tanner's wool will show a greenish yellow fluorescence, due to the depilatory, while the new wool shows a purplish blue fluorescence.

We also use the microscope to distinguish different fiber structures and different types of fibers and stages of fibers. In felting, the fibers are very well broken up and the microscope helps us to determine the history of the felts.

We may do more to develop it as we go along but so far in about the year and a half that we have been doing it, I think we have made pretty good progress primarily with the ultra-violet fluorescence.

If there are any questions that you have on the ultra-violet fluorescence in this particular phase, I shall be glad to answer them if I can. (Applause.)

. . . Dr. Carl Z. Draves took the Chair at this point . . .

Dr. Draves: We are certainly indebted to Mr. Himmelfarb for so kindly speaking to us. His words show that Mr. Sampson's paper this morning was very opportune and that the New York State Department of Labor is using the very latest methods in its work.

Are there any questions?

I want to present to you now Mr. Appel who will read a paper by Mr. Mease of the U. S. Bureau of Standards.

Mr. William D. Appel: Don't you think it would be just as well to simply publish this paper and proceed with the meeting? I had forgotten that the paper was the first one this afternoon until Mr. Freedman came out and told me.

Dr. Draves: Mr. Appel, Dr. Rose has gone after his lantern slides, so if you will just go ahead—(laughter).

Mr. Appel: Mr. Mease asked me to read this paper for him.

. . . Mr. Appel presented Mr. Mease's paper, "Quantitative Analysis of Fiber Mixtures," in abstract . . (Applause.) (*See next page;*

MEETING, SOUTH CENTRAL SECTION

ON Saturday night, January 26, 1935, the South Central Section held its regular winter meeting at the Read House in Chattanooga, Tenn.

In the election of officers, quite a lively contest occurred, with only active members taking part.

The results were as follows:

For Chairman, Harold Schroeder, Dixie Mercerizing Co.; for Treasurer, Homer Whelchel, Central Franklin Process Co.; for Secretary, H. Bruce Kimbell, Dixie Mercerizing Co.

E. P. Davidson of the E. I. duPont Co., presented a very interesting paper on vat dyeing in package machines. A very constructive discussion followed.

Respectfully submitted,
H. BRUCE KIMBELL, *Secretary.*

Proceedings of the American Association of Textile Chemists and Colorists

Analysis of Mixtures of Textile Fibers*

By RALPH T. MEASE†

The increasing use of fabrics composed of mixtures of fibers, and the increased practice of standardization and honest labeling of textile products, give rise to a demand for accurate analytical methods. This paper deals with the criteria by which an analytical method may be evaluated. Accuracy of the results, need for definition of the material to be determined, and qualifications of the analyst, are discussed. Some common methods as ordinarily used for the quantitative separation of wool and cotton are examined with reference to inherent sources of error. The effect of reagents suggested for quantitative separation of acetate rayon (acetone soluble), the regenerated cellulose rayons, cotton and mercerized cotton, silk, and wool, on the weight of the fibers is indicated.

I. INTRODUCTION

THE current interest in methods for the analysis of textile fiber mixtures has arisen as a result of the increasing production of fabrics made from two or more fibers, with which all of you are familiar, and as a result of the trend toward more explicit labeling of textiles for the benefit of the user. Thus, the Federal Trade Commission, acting in accordance with the desire of the knit underwear industry, adopted a ruling in 1930, requiring that "the word 'wool' shall not be used in any way in the labeling, advertising, merchandising or selling of knit underwear unless the percentage by weight of wool contained in the garment is stated." Another example of explicit labeling is the Commercial Standard for "wool and part-wool blankets" established by the joint action of producers, distributors, and users, which became effective April 1, 1933. It provides for the labeling of part-wool blankets with the guaranteed minimum wool content. These activities suggest the need for reliable quantitative methods of analysis for textiles.

The research committee of this Association has four sub-committees engaged in providing methods to meet this need. One of these, under the chairmanship of Claxton Monro, is concerned specifically with the analysis of fiber mixtures. The problem is also receiving active consideration in Committee D-13, on Textile Materials, of the American Society for Testing Materials.

The purpose of this paper is to indicate the nature of the problem of analyzing fiber mixtures, to suggest how a satisfactory method of analysis can be recognized, and to outline briefly the methods which seem to be most promising for the more common fibers in the light of recent work at the National Bureau of Standards.

II. THE PROBLEM

There are two distinct phases of the problem of analysis of fiber mixtures. The first is to define just what is to be determined. The terms "cotton" and "wool," for example, may mean quite different things to the manufacturer of textiles, to the user, and to the analyst. Raw cotton as it comes from the bale, cotton in well-bleached sheeting, and the purified cotton cellulose of the laboratory are by no means the same material. The manufacturer may regard yarn or cloth made by mixing 50 pounds of greasy wool with 50 pounds of raw cotton as a 50 per cent wool fabric. The user may have a different view if he finds less than 50 per cent of good clean wool fiber in the product. It is questionable whether degraded wool or cotton would meet the user's idea of "wool" or "cotton."

The analyst thinks of wool or cotton as something to be isolated from the mixture and weighed. He has to serve both the manufacturer and the user, both seller and buyer. Obviously, he cannot devise a method of analysis until the materials to be determined have been defined to the mutual satisfaction of seller and buyer.

The second phase of the problem is the particular job of the analyst. It is to find some means to segregate the different fibers of the mixture or to isolate some component which bears a definite relation to the fiber, whose amount is to be determined.

The analysis of mixtures containing the common fibers will be discussed with special reference to these two phases of the problem. It is assumed that physical separation is not practicable; for example, that the components are not present in separate yarns and cannot be separated readily by dissecting a sample.

*Presented at Annual Meeting, December 8th, 1934.
†U. S. Bureau of Standards.

III. WOOL-COTTON TEXTILES

Wool-cotton textiles will be discussed at some length because they are perhaps the most frequently analyzed.

In general, textiles made from mixtures of wool and cotton fibers may be considered as being composed of: (1) wool fiber (protein); (2) cotton fiber (cellulose); (3) natural oils, waxes and other constituents of the raw fibers which have not been removed completely in the course of manufacture of the textile; (4) oils, soaps, waxes, starches, clay and other materials which have been added, collectively termed sizing and finishing materials; (5) degraded protein and cellulose resulting from any cause. In addition there is always a certain amount of moisture; some of it associated with the wool, some with the cotton, and some with the other constituents.

The analyst has no practicable method for separating the wool fiber with its associated natural impurities from the cotton fiber with its associated natural impurities. He cannot readily remove from the mixture the added substances, the sizing and finishing materials, without removing some of the natural non-fibrous constituents. Neither sulfur nor nitrogen is a sufficiently characteristic nor constant component of wool to serve as a measure of the amount of that fiber in the mixture. The analyst *can* isolate and weigh the wool protein and the cotton cellulose.

This, then, is his logical approach to the problem. He attempts to remove all foreign non-fibrous materials, whether natural or added in the course of manufacture, from the fibers in a weighed specimen and then to isolate the wool protein or the cotton cellulose and to weigh it.

If the analyst can free the fibers without damage from all extraneous substances, weigh them, and then eliminate one of them quantitatively, the amount of the fiber which was eliminated is the difference between the weights of the mixture and the fiber recovered. However, analyses seldom account for exactly 100 per cent of the original material, and the analyst prefers to isolate and weigh the important constituent of the mixture if he can because of the uncertainty of a result obtained by difference. An analyst would not want to report the gold content of a lead ore by analyzing for lead, silver, etc., and calling that part which is unaccounted for, gold. Neither would he like to put a cotton-wool mixture through a treatment to remove extraneous materials, then dissolve out the wool, weigh the cotton cellulose, and call the difference wool. Wool is the more costly component of the mixture usually, and the analyst prefers to isolate and weigh the wool if he can. This point is stressed because of the very general practice of determining cotton in such mixtures and estimating the wool by difference.

Assuming that all extraneous materials have been eliminated from a cotton-wool sample to be analyzed, for example, by the action of solvents or hydrolytic enzymes, or that such materials will be eliminated by the treatment used to isolate the component fiber which is to be weighed, then how can one kind of fiber be removed from the mixture without affecting the weight of the other?

Wool can be eliminated from a mixture with cotton by dissolving it in hot dilute sodium or potassium hydroxide solution. This method is, as you know, widely used. Wool keratin, some degradation products of both wool keratin and cotton cellulose, and cotton waxes are removed by the alkali. The cotton cellulose is left as a residue to be weighed. This method is recommended for use when cotton is to be determined. When this method is used in ordinary work to determine wool in a mixture, the result obtained should be called "alkali soluble material" rather than "wool."

Cotton can be eliminated from a mixture with wool by dissolving it in sulfuric acid or by carbonizing the cotton with aluminum chloride and separating the degraded cellulose. Our experiments at the National Bureau of Standards show that the results obtained with the sulfuric acid method are too high by from 5 to 10 per cent of the wool protein present. The wool combines with the sulfuric acid and very tenaciously holds enough to increase its weight by this amount. Carbonization with aluminum chloride has given results correct to within ± 1 per cent of the wool protein present and for that reason is recommended for general use.

IV. MIXTURES CONTAINING CELLULOSE ACETATE RAYON, SILK, VISCOSE RAYON

When cellulose acetate rayon, silk, regenerated cellulose rayon, or when any two or three of these kinds of fibers are present in addition to cotton and wool, it becomes necessary to determine some by difference because practicable methods for isolating first one, then another of the fibers are not available. The removal of non-fibrous substances must be thorough, yet the weight of the fibers must not be changed by the treatments.

The methods published as tentative standard D276-33T by the American Society for Testing Materials with certain changes are the most satisfactory for general purposes that we have tried. According to these methods, cellulose acetate rayon is removed from the mixture with acetone and estimated by difference. Silk is removed with an aqueous solution of calcium thiocyanate of specific gravity 1.20 acting for 15 minutes at 70° C., and is determined by difference. Regenerated cellulose rayon is removed with an aqueous solution of calcium thiocyanate of specific gravity 1.36 acting for 15 minutes at 70° C.

One phase of this procedure on which work is now in progress is the action of the thiocyanate on the different types of regenerated cellulose rayons. Ordinary viscose rayon appears to be more readily soluble than some of the other types, and highly oriented viscose is rather difficult to get into a filterable solution. Another difficulty that

presents itself is the effect of twist and weave. The fibers swell in the reagent and may not go into solution because of the compactness of a tightly twisted yarn or closely woven fabric. However, it is possible to avoid this trouble by partially dissecting the specimen or cutting it up, and by providing adequate mechanical agitation.

The rather remarkable feature of this method of analysis is the quantitative character of the separation, even of fibers as closely allied in chemical structure as viscose rayon and cotton. The data in Table I, obtained from experiments in which the purified fibers were treated with the reagents under the conditions of the method, illustrate this point. Some data on the effect of the reagents used in separating cotton and wool are also shown.

V. SELECTING A METHOD

Several factors must be taken into consideration in selecting a method of analysis. The most accurate method may be too elaborate or time-consuming and a less accurate method may give results that are good enough for the purpose. However, these practical considerations make it none the less important to know both the precision and accuracy.

One check on the accuracy of a method for analyzing fiber mixtures can be had by analyzing samples of the purified fibers and known mixtures of them. The analyst should put purified fibers through the procedure he uses in analyzing mixtures as a check on his manipulation and reagents. He may be getting too low or too high results depending upon whether the treatment is too drastic or not completely effective. He should analyze known mixtures because the dissolved fiber may be difficult to remove from the remaining fibers.

It is practically impossible to establish a general method of analysis which will provide for the removal of all possible sizing and finishing materials. The analyst should be prepared to vary the procedure to meet special conditions. Further, short cuts are possible when materials of known history are to be analyzed. The analyst should be on the lookout for unusual sizing and finishing materials which may necessitate the modification of the method of analysis. The method to be used should be tried on purified fiber mixtures and on fibers treated with the sizing and finishing materials known to be present in the textiles to be analyzed.

The precision of a method, that is, the duplicability of the results, can be judged by repeated analyses of the same material even though its composition is not known. High precision must not be confused with high accuracy. A method may give very nearly the same result on a given material every time it is analyzed, but the result may be wrong. Only through frequent control tests can the probable accuracy of the analysis be established.

The accuracy of the analyses of mixtures of purified fiber mixtures, as shown in our work to date, are indicated in Table I.

TABLE I

Effects of reagents used for separation of fiber mixtures, on common textile fibers. The maximum percentage differences between the weights of the fibers before and after treatment are given.

Reagent	*Acetate rayon*	*Silk*	*Viscose rayon*	*Cotton*	*Wool*
Acetone	soluble	1%	1%	1%	1%
Calcium thiocyanate Sp. g. 1.20	.....	soluble	0.5	0.3	1
Calcium thiocyanate Sp. g. 1.36	.....	.....	soluble	1 (mercerized) (cotton 3)	1
Potassium hydroxide 5% aqueous solution	.....	.....	.....	0.3	soluble
Sulfuric acid (App. 72%)	.....	.....	.....	soluble	10
Aluminum chloride carbonization	.....	.....	.....	destroyed	0.3

VI. INTERPRETATION OF RESULTS

When the amounts of cotton cellulose, of wool protein, of silk fibrion, etc., in a sample have been found with a known degree of accuracy, the question of interpretation of the results arises. It is quite generally conceded that starch, clay, added oil, etc., in a textile should not be considered "wool" or "silk." There are differences of opinion as to whether, for example, the natural waxes of cotton, which have been left as a result of incomplete processing, and the regain moisture should be considered a part of the "cotton." These are variables and any allowances to be made for them must be arbitrary. When such "corrections" are applied to the results of an analysis, the new result is really of no more utility than the old. Therefore, it seems reasonable to suggest that the results of all chemical analyses of fiber mixtures be based upon the weight of the dried sample and that cotton cellulose, wool keratin, and silk fibrion be reported as such or that they be considered synonymous with "cotton," "wool," and "silk" for the purpose of analysis.

VII. RESPONSIBILITY OF THE ANALYST

In conclusion, emphasis should be laid on the importance and responsibility of the analyst in the analysis of fiber mixtures. Accurate, dependable results cannot be expected where fabrics of varied composition are analyzed by the novice or by the analyst who is unable to cope with the unexpected. The analyst should understand the material and adjust his method to it. He should have a knowledge of the probable sources of error and should determine the accuracy of his results by means of blank determinations on reagents and mixtures of known clean fiber content. The assets of a good analyst are experi-

ence, skill, and ability to interpret results. Standard methods of analysis are his tools, but even the best method of analysis will fail if it is not used with judgment.

Dr. Draves: We are much indebted to Mr. Appel for filling in the time so satisfactorily.

I want to take a moment to ask Professor Schwarz about the separation of fibers quantitatively by means of the microscope.

Professor E. E. Schwarz: Why bring that up? (Laughter). There is only one thing you can say about that. The separation, if, as and when possible, in many cases gives you a volumetric rather than a gravimetric analysis. Until we can get some better data on the specific gravity of fibers involved, and not just pure cellulose, we are going to have difficulty in relating the findings from the microscope, which are volumetric, to the ordinary chemical analysis, which are gravimetric. Until we have some more reliable data, we will have to keep the two things separate.

In the case of, say, ten per cent wool mixture with cotton, I am strongly convinced that the volumetric method is of more service to the consumer, the user, than the other method, because that means one wool fiber per cross section of the yarn. You can't convince me that the difference between a ten and twenty per cent mixture of cotton makes any difference in the heat transmission of fibers. The addition of one more fiber is not enough to change the properties of the yarn in that respect. Yet I have a neighbor who took material back because it was twenty per cent and exchanged it for thirty per cent goods and she feels that she got a better buy as the result.

Those things have to be considered and we still lack further data to bring the two together. I don't think that we are going to rely on either method for our separation of fibers, and the most forward looking step that I know of is the Chemists' and Colorists' Standards in which both standards are recognized and given proper emphasis, I think. (Applause).

Dr. Draves: I shall try now to get back to my schedule. Since Dr. Rose is a few minutes late, we will have to cut him down from thirty minutes to twenty-eight. (Laughter).

I now have the pleasure of presenting Dr. Rose who will speak to you on "The Mechanism of Dyeing—Part II". (Applause).

. . . Dr. Rose then delivered his prepared paper . . . (Applause).

The Mechanism of Dyeing—II*

By **ROBERT E. ROSE**†

THREE years ago at our annual meeting in Boston I presented to you an account of the theories of the mechanism of dyeing as they had been elaborated to that date. In the three years that have elapsed since then our knowledge of this very interesting subject has been made much more complete by studies that have been really quantitative. At that time I tried to cover the whole field by discussing all the fibers. Today I wish to emphasize what has been done in elucidating the mechanism of dyeing cellulose fibers. In my previous paper I made the statement that I was certain that particle size was one of the important characteristics which determined whether a dye would be substantive or not. I also described to you a method which I had devised for making a rough measure of particle size as it existed under the conditions of the dyebath. What I did was to take a glass vessel, divided into two parts by a membrane of regenerated cellulose (Cellophane) and on the one side I placed a solution of the dye and salt as it would be used in dyeing and on the other side a solution of salt of equal concentration. The whole vessel could then be immersed in boiling water so that it was possible for the first time to measure in a comparative way the ease with which direct dyestuffs passed through an uncalibrated membrane.

I believe this was the first occasion on which any kind of an effort was made to determine particle size at the boil, and when I spoke to you I pointed out that to my mind this was essential in reaching any conclusion regarding the real relation between particle size and dyeing properties.

While the membrane was not calibrated and my experiments were only roughly quantitative, I was able to make the following generalizations:

*Presented at Annual Meeting, Dec. 8th, 1934.
†E. I. du Pont de Nemours & Co.

1. All basic colors and most of the simpler acid dyeing colors are in a degree of dispersion not far from molecular, even at room temperature and under the conditions of the dyebath.

2. Some acid dyes, more particularly those extremely sensitive to hydrogen ion concentration and those known to the dyer as neutral dyeing colors, are relatively much less highly dispersed. They pass through a viscose membrane slowly, even at 100° C.

3. The direct dyeing colors vary enormously in particle size under the conditions of the dyebath. With the usual concentration of electrolyte, .3 to .4%, they do not diffuse at room temperature. Most of them pass through the membrane at the boil but some so slowly as to make the diffusion a matter of a long time.

4. The level dyeing rayon dyes are all highly dispersed at the dyeing temperature and even at temperatures a good deal below the boil.

In addition to these statements I stated that there were direct colors which would not diffuse through the membrane under any conditions, but I have reason to believe that this statement is not correct—at least it should be checked. Apparently the salt concentration I used was higher than I thought, because of a misunderstanding in carrying out the experiments, and this may have prevented diffusion.

With this one exception these generalizations are still valid. As I told you at that time, I hoped to return to these experiments and refine them, but I was unable to do so, and the paper I read to the Association and published in the Proceedings remained my only publication. Perhaps because of its general nature it was not given the attention that would have come to it if it had been a purely scientific contribution to the literature. Perhaps it is for this reason that T. H. Morton, in a paper read before the Faraday Society in September of this year, felt justified in stating "no record has been found of ultra-filtration of the dye solutions performed in the temperature range of 70°-100° C. In order to relate the colloidal behavior of the direct dyes with the other dyeing properties it is essential that ultra-filtration experiments designed to this end should be carried out at the higher temperatures used in the dyeing process." I believe that my diffusion method, simple as it is, is even more significant than that of ultra-filtration and it certainly allows of investigation of the conditions as they are in the dyebath during dyeing.

The results of these experiments with the crude diffusion cell made me very anxious to investigate the actual relative particle size of dyes in solutions containing electrolytes. I am not primarily a physical chemist and this being essentially a physical chemical problem, I entrusted it to Dr. Samuel Lenher of my staff and he, with Dr. J. Edward Smith, carried out a series of most interesting experiments, as a result of which three papers will shortly appear, one in the *Journal of Industrial and Engineering Chemistry*, Vol. 27, page 20, January, 1935, and two in the *Journal of the American Chemical Society*. These papers contain a very great deal of material which is new, although they are based on an experimental method which is old. I will refer those of you who are interested to these papers for all details, and here I shall content myself with outlining to you what we did and what we learned.

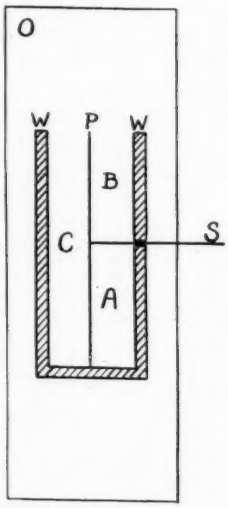


Fig. 1

At first we made a reconnaissance of the whole field. We needed a simple and quickly applied method of measuring the rate of diffusion of dyestuffs and we chose to use the micro diffusion cell of Fürth. Essentially this little instrument (Fig. 1) is composed of a rubber cell fastened to a microscope slide with a water resistant cement. The cell is divided lengthwise into halves by a celluloid strip (P) which is sealed with Canada balsam. The right half of the cell is divided horizontally by a movable celluloid strip (S). This slide is sealed into the cell wall and yet made movable by the use of stop-cock grease, and is operated manually.

The dye solution made at the boil, was allowed to cool. The appropriate amount of sodium chloride was added to it and it was then allowed to age. It was introduced into the lower half of the diffusion cell (A), the slide was then closed and the upper half (B) was filled with water containing the chosen amount of salt. The other half of the apparatus (C) was filled with a solution of dye which was only one-fourth or perhaps in some cases a thirty-second of the concentration of that in A. When everything was in position the celluloid slide was pulled out and the dyestuff solution was free to diffuse into the water above it. The rate at which it diffused, to a point at which the concentration was equal to that of the dilute solution used for comparison, was determined by observation by means of a micro comparator. Our effort was to see whether such results could be made comparable and we found that they could be. We also wished to see whether there was very much difference in particle size at 25° C. and we found that there was. We then carried out some dyeings at the low temperature to see if there was any difference between particle size and absorption by cotton and again we found there was. Indeed we were able to show that dyeing, at least as far as low temperature is concerned, will not take place unless the radius of the dye particles is less than 17 x 10^{-8} cm. We

were also able to show that dyestuffs differ very greatly in their tendency to agglomerate when salt is added. This table will give an idea of the results we obtained. (Table I).

TABLE I

Diffusion Constants and Particle Sizes of Dyes at 25° C.

Dye No.	Conc. Dye* g./l.	Conc. NaCl g./l.	$D \times 10^{6}$ sq. cm./sec.	$R \times 10^{8}$ cm.
1	1.2	...	2.67	9.1
	1.2	12.0	1.74	14.0
2	1.2	...	1.85	13.2
	1.2	12.0	1.97	12.3
3	0.8	...	2.33	10.4
	0.8	6.0	1.36	17.9
6	1.0	...	1.46	16.6
	1.0	6.0	1.56	15.6
5	1.0	...	1.97	12.3
	1.0	6.0	1.16	21.0
4	2.0	...	2.09	11.6
	2.0	6.0	0.93	26.1
8	1.2	...	1.52	16.0
	1.2	6.0	0.88	27.6
7	2.0	...	1.55	15.7
	2.0	6.0	Flocculated	
9	2.0	...	1.04	23.3
	2.0	6.0	0.83	29.2
11	1.0	...	3.95	6.1
	1.0	6.0	2.04	11.9
12	2.0	...	0.89	27.3
	2.0	6.0	0.98	24.8
10	2.0	...	0.64	37.9
	2.0	6.0	0.50	48.5

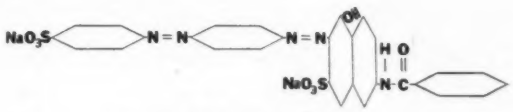
* Concentrations of dye are expressed in terms of the commercial material.

The smallest particle size which we observed was 12 x 10^{-8} cm. in the presence of six grams per liter of salt. The largest particle was 48 x 10^{-8} cm. in the same salt concentration. The molecular weights from these figures would vary all the way from 939 to 200,000. That is to say, that at 25° C. in the presence of salt a direct dyestuff may contain micells composed of as many as 225 molecules though for most dyes they range between 10 and 100 molecules per micell.

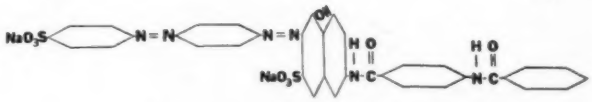
We were also able to show that there is a direct relation between a tendency to agglomerate and the chemical constitution of the dyes. Having completed this preliminary investigation, we went on to what we consider a much more important investigation, namely, that of dyestuffs under the condition of the dyebath. Obviously the micro diffusion cell is useless for high temperature measurements. Dr. Lenher therefore selected the method previously described by Northrup and Anson, J. Gen. Physiol., *12,* 543 (1929), using a glass diaphragm. For our measurement we decided that it would be best to choose two dyestuffs which differed extremely in dyeing properties but which differed only slightly in chemical constitution. We chose the two reds

(1) p-Sulfobenzene-azo-benzene-azo-6-benzoylamino-1-naphthol-3-sulfonic acid (sodium salt)

(2) p - Sulfobenzene - azo - benzene-azo-6-benzoyl-p-amino - benzoyl-amino-1-naphthol-3-sulfonic acid (sodium salt)



Pontamine Fast Red 8BL



Pontamine Fast Red 8BNL

The first of these is commercially known as Pontamine Fast Red 8BL, a very level dyeing fast to light color of very poor fastness to washing. The second is Pontamine Fast Red 8BNL, which differs chemically only in containing an extra CONH grouping and is not so level dyeing and very much faster to washing than Red 8BL.

For this work we made every effort to obtain pure dyestuffs. They were made from repurified intermediates and the final products were submitted to a purification by the method which I originated some years ago, conversion to the aryl guanidine salt, purification with water until there was no reaction for chlorides or sulfates and then conversion of the aryl guanidine salt to the sodium salt in an alcoholic medium and removal of all the free aryl guanidine by washing with alcohol. The products we obtained were as pure as dyes can be made and we believe that the purity we obtained by this method is greater than that possible by any other, not even excepting the method of purification with sodium acetate, which gives excellent results.

With these pure dyestuffs we were able to show that Hartley and Robinson were perfectly correct in stating that it is impossible to use the diffusion of a dyestuff into pure water as a measure of particle size, because the colored ions are dragged along by the positive rapidly moving sodium ions. Indeed we had already done so in our previous work by finding that even a low concentration of sodium chloride per liter is sufficient to offset this interference and to allow of observing quantitatively the diffusion of the colored ions, uninfluenced by the electrolytes produced by the dyestuff itself. (Tables II and III).

Our conclusions are essentially these: The level dyeing Red 8BL is highly dispersed even at low temperatures. At the boil its dispersion is nearly molecular. Red 8BNL is highly aggregated at 25° C., a rise in temperature has little effect until a temperature of 80° C. is reached, then the micells break down from a particle size of about 25 x 10^{-8} cm. to 19 x 10^{-8} cm. and with the next 15° C. rise in temperature the particle size drops still further to 11.3 x 10^{-8} cm. In order to give you a better notion what

TABLE II

Absorption Experiments with Dyes (1) and (2)

Dye	Electrolyte T. °C.	Time Hours	No Assistant g. Dye 100 g. Cotton	NaCl 2.5 g./l. g. Dye 100 g. Cotton	NaCl 6.25 g./l. g. Dye 100 g. Cotton
1	25	1	0.058	0.468	0.600
1	25	24	0.120	0.928	1.416
1	100	1	0.028	0.460	0.700
2	25	1	0.004	0.064	0.140
2	25	24	0.040	0.160	0.240
2	100	1	0.010	0.840	1.060

The maximum possible strength is 2.0 g. per 100 g. of cotton.

TABLE III

Absorption Tests at Varying Temperatures

T.	Dye (1) g. Dye Absorbed per 100 g. Cotton	T.	Dye (2) g. Dye Absorbed per 100 g. Cotton
50	0.872	50	0.175
65	0.860	65	0.414
80	1.008	80	1.050
100	0.570	100	1.126

Time = 1 hr. NaCl Conc. = 6.25 g./l. Dye Conc. = 0.500 g./l.
Volume = 100 cc. Cotton = 2.5 g.

these figures mean we can compare the molecular weights at the different temperatures. The initial molecular weight is about 65,000, at 80° C. it drops suddenly to 26,700 and at 95° C. to 5,800. Comparing this with Red 8BL, its molecular weight at room temperature is 9,400, at 65.8° C. it drops to 3,390, at 80° C. to 3,000 and at 95.5° C. to 2,700. These solutions all contain 6.25 grams per liter of sodium chloride.

The real interest of these measurements is apparent when we compare the dyeing characteristics of these two colors carefully. We proceeded, at my suggestion, to determine the equilibrium reached between fiber and dyestuff at different temperatures for these two dyes in the presence of sodium chloride. Dr. Smith found that a cold dyeing of Red 8BL at 25° C. came to an equilibrium within 24 hours and that about 1.3% of a total possible 2% was absorbed in the presence of 6.25 grams of salt per liter. When he raised the temperature to 100° C. equilibrium was reached within an hour and the amount of dyestuff on the fiber was only half of that on it at 25° C. Turning to the more highly aggregated Red 8BNL he found that at 25° C. no more than .24% out of a possible 2% was absorbed, while at 100° C. in one hour 1% was absorbed. (Tables IV and V).

The study of the time required to reach equilibrium and the distribution of dyestuff at equilibrium for low and high temperatures for these two dyestuffs was most instructive, as I hoped it would be when I asked Dr. Smith to make a particular effort to get data on this point. He found that in the case of Red 8BL, without any assistant in the dyebath, equilibrium was reached in 120 hours, possibly sooner, and that practically no color went on, out of a possible 2 grams only 0.18 g. being absorbed. In a solution containing 6.25 grams per liter of salt a 1.4% dyeing resulted within 50 hours and no further change occurred even on standing for 550 hours. At the boil, with no assistant, no color went on at all and with sodium chloride in the solution a 0.57% dyeing was obtained in one hour and no further change occurred up to six hours. Notice that the high temperature dyeing was weaker than the low temperature dyeing. Turning to the more aggregated dyestuff, Red 8BNL, Dr. Smith found that without any assistant he obtained roughly a 0.24% dyeing in 54 hours and no further increase in 550 hours. With assistant, in 211 hours his dyeing was approximately 0.38% and in 576 hours it was still the same. At a temperature of 100° C. with salt in the bath in one-half hour he obtained a 0.84% dyeing, in one hour a 1.2% dyeing, in three hours a 1.24% dyeing, in six hours a 1.33% dyeing and in 24 hours a 1.48% dyeing. In other words at room temperature the dyestuff never reached an equilibrium anywhere near comparable to that reached at a high temperature. The high temperature dyeing was much stronger and took a very much longer time to reach equilibrium than that of the highly dispersed dye. It is particularly interesting to note that between 211 and 576 hours at room temperature the dyeing did not increase over 0.38%, while the equilibrium for the small particles which are obtained at high temperatures would be in the neighborhood of a 1.35% dyeing. This result must be borne in mind when stating that a dyestuff contains particles of all sizes in equilibrium and that the equilibrium is re-established as the particles of any one size are removed. This may be quite true but the equilibrium is not re-established rapidly, certainly not in the case of the dye Pontamine Fast Red 8BNL.

TABLE IV

Study of Equilibrium Absorption of Dyes (1) and (2)

Time	T.	g. Dye (1) Absorbed per 100 g. Cotton No Asst.	NaCl 6.25 g./l.	Time	T.	g. Dye (2) Absorbed per 100 g. Cotton No Asst.	NaCl 6.25 g./l.
120 hrs.	25	0.180	....	54 hrs.	25	0.240	....
335	25	0.170	....	557	25	0.240	....
50	25	....	1.412	211	25	....	0.380
553	25	....	1.432	576	25	....	0.380
0.5	100	....	0.540	0.5	100	....	0.844
1.0	100	....	0.570	1.0	100	....	1.126
3.0	100	....	0.570	3.0	100	....	1.240
6.0	100	....	0.570	6.0	100	....	1.330
				24.0	100	....	1.480

Volume = 100 cc. Dye Conc. = 0.500 g./l. Cotton = 2.5 g.

TABLE V

Dye Particle Size Variation with Temperature

Dye	T. °C.	$D \times 10^{-5}$ cm.²/sec.	$R \times 10^{-3}$	m
(1)	50.1	3.10 ± .07	13.7	9400
(1)	65.8	5.61 ± .11	10.2	3900
(1)	80.0	7.70 ± .18	9.3	3000
(1)	95.5	10.05 ± .3	9.0	2700
(2)*	25.1	0.96 ± .06	25.3	65000
(2)	50.2	1.75 ± .05	24.6	59700
(2)	65.5	2.26 ± .08	25.2	64200
(2)	80.6	3.86 ± .10	18.8	26700
(2)	95.4	7.80 ± .18	11.3	5800

* Value obtained by Fürth method during calibration of cells.

The fact that we got such a very small quantity of dye from the less highly dispersed Red 8BNL on to the fiber in the presence of 6 grams of salt per liter may be explained by assuming that the cotton removes all the small particles present and that the larger particles do not break down into small ones fast enough to re-establish the balance, or it may be that under the concentration per unit volume of the solution for the dyeing size particles the equilibrium between the cotton and the solution would be represented by the tint we got. Some light may be thrown upon these possibilities by the fact that if the concentration of pure dye is increased, the strength of the dyeing at room temperature in the presence of salt also increases. In a large excess of a solution of 10% of Red 8BNL in water containing 6 grams per liter of salt cotton will take up dyestuff equivalent to a strength of about an 8-ounce dyeing at the boil, which at least shows that cotton can take up a higher concentration of these small particles than the quantity it takes up from a solution of 1 gram per liter of color. While there is nothing in my experiments to make certain, I feel that actually in the case of this color the equilibrium re-establishes itself very slowly. Unfortunately I did not think to try the experiment of placing a fresh piece of cotton in the bath from which I had obtained the tint to see whether all the small particles had been removed. This experiment is under way now but it takes too long to allow of the result being given to you at this meeting.

We obtained further confirmation of the validity of associating particle size and dyeing properties by an experiment which Dr. Smith carried out for me and which is not reported in the papers to which I have made reference. A diazotized and developed color is so insoluble that the fastness to washing is usually very good but the developed color cannot be used as a direct dyeing dyestuff because it will not go on the fiber. By making a coupling of a diazo color with beta naphthol in a water solution and then dyeing the precipitated dyestuff at a temperature of 125° C. in an autoclave, we found that we could get a perfectly good dyeing so that this is additional evidence that the particle size falls off as the temperature rises, and that it is possible to convert too coarse a dyestuff into one suitable for dyeing merely by changing the temperature.

It is interesting to note that in studying the effects of sodium chloride and sodium sulfate we found that sodium sulfate aggregates dyestuff micells much less actively than does sodium chloride, which is another way of saying that the dyer is justified in using Glauber's salt if he wants to obtain more level dyeings on rayon.

In the short time at my disposal it is impossible to do more than give you this outline, but I think that we can say that in the Technical Laboratory during the past two years we have proved definitely the following points:

All substantive colors are characterized by possessing at the temperature of the dyebath a particle size not greater than 17×10^{-8} cm. If the particle size under the same conditions is less than 11×10^{-8} cm. the dyeing at the boil will be a good deal weaker than it will be at lower temperatures. Dyestuffs which show a very great change in particle size with rise in temperature, that is, dyes which at room temperatures are aggregated to particles larger than 17×10^{-8} cm. but drop to a value of 11×10^{-8} cm. at the boil, will be fast to washing for direct colors. They will be less level dyeing and will show faults on rayon more than the dyes which at room temperature possess a particle size suitable for dyeing and which are very mobile at the higher temperature of the dyebath. The tendency to aggregate in the presence of an electrolyte and the tendency to disaggregate with rise in temperature are intimately connected with the chemical constitution of the dye. Mere particle size is in itself not sufficient to cause an aggregate to act as a substantive micell toward cellulose.

I should like to outline to you the very excellent results obtained by Neale and his co-workers in England by which he is able to show that the dyeing of cellulose in the form of a regenerated sheet appears to partake of the nature of a diffusion and that it can be described by an equation worked out by Hill for the absorption of oxygen in muscle. Neale's work is quantitative and extremely valuable; however, up to the present he has not used it to formulate any theory of dyeing.

In this country Dr. Morey, fellow of the Textile Foundation, has been able to show by a very ingenious method that when a direct dyestuff is taken up by cellulose fiber the dyestuff micells are associated with the micells of the cellulose fiber, that is to say, that if cotton, having a definite micell orientation is dyed with a direct color, the direct color assumes the same orientation. The results of Dr. Morey's work have been published in *Textile Research*, the publication of the United States Institute for Textile Research, and I recommend his papers to you. They are extremely interesting.

From what I have told you and from a great deal that I have read, which I have no time to tell you, I feel highly encouraged regarding the progress of the past few years in elucidating the mechanism of dyeing, particularly of cellulose fibers, and I may be pardoned if I take pride in the fact that the laboratory for which I am responsible, and other laboratories in this country, have taken their place in the front rank of this advance.

Dr. Draves: It is very gratifying to me, as it must also be very gratifying to you, that our own President, Dr. Rose, is taking the lead in the United States in this study of the mechanism of dyeing.

Are there any questions that you would like to ask Dr. Rose?

Dr. Smith: Is there any relation between the size of these dye particles and the micro-pores of the cellulose?

Dr. Rose: Well, I rather imagine there must be but we are not anywhere nearly far enough along to talk about that.

Dr. Draves: Are there any other questions? We have time for about one more.

. . . At this point Dr. Rose resumed the Chair . . .

President Rose: The next paper on this afternoon's program is "Inconel, An Alloy for Textile Wet Processing Equipment," by F. L. LaQue of the International Nickel Co. (Applause.) This paper will appear in a later issue.

ANNUAL MEETING, MIDWEST SECTION

THE annual meeting of the Midwest Section was held Saturday, February 2nd, at the Bismark Hotel, Chicago, Illinois.

Dinner was served at 7:15, 68 members and guests being present for dinner, which number was later augmented by the arrival of 12 guests for the lecture.

Minutes of the previous meeting were read and approved. Chairman Hempel recalled the activities of the section for the past year, and the Treasurer's and Secretary's Reports were read and approved.

Chairman Hempel then called on B. C. Blowney, Chairman of the nominating committee, who announced his committee also included the following: L. B. MacFarland, Harry Proudfoot, Geo. Warburton and Hugh McKenna. Mr. Blowney then announced the names of the candidates selected by his committee, all of whom were later unanimously elected to office.

Chairman—Arthur T. Brainerd.

Vice Chairman—Joseph F. Feit.

Treasurer—G. R. Kremers.

Secretary—Elias A. Johnson.

Members of Sectional Committee—A. J. Feit, V. T. Hartquist, E. J. Siegrist, Elmer F. Smith.

Representative to the National Council—B. C. Blowney.

Representative to National Nominating Committee—Elias A. Johnson.

Dr. Herbert F. Schiefer, of the Bureau of Standards, was then introduced. He gave an illustrated address on "The Hosiery Testing Machine and its Use". The results shown by this machine were of unusual interest to our various members and their guests in the hosiery business. The substance of Dr. Schiefer's address, as well as most of the charts of results, is contained in Bureau of Standard Research Papers Nos. 679 and 753, available at the Superintendent of Documents, Washington, D. C., at 5c per copy.

There being no further business, the meeting was adjourned at 10:40 P.M.

Respectfully Submitted,

E. F. SMITH,
Secretary Midwest Section.

NINETY-NINTH COUNCIL MEETING

THE Council held its 99th meeting in the Providence Engineering Society Building, 195 Angell St., Providence, on Friday afternoon, January 25. Present were President Robert E. Rose, presiding; William H. Cady, Vice-President; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; Carl Z. Draves and Hugh Christison, Councilors at Large; Heyward F. Lawton representing Rhode Island; and Harold C. Chapin, Secretary.

The minutes of the last meeting were approved as read. The Treasurer's report of January 24, and the Secretary's balance sheet of January 23, both attached hereto, were accepted.

It was voted that the Association, accepting the invitation of the South Central Section, hold its Annual Meeting of 1935 in Chattanooga. In consideration of locations of Sections and numerical distribution of membership among them, it was further resolved that meetings be held thereafter in rotation through three groups of Sections, comprised respectively of Northern New England and Rhode Island; New York and Philadelphia; Piedmont, South Central, South East, and Mid-West.

The Secretary was instructed to express to the New York Section the Council's appreciation of the excellent arrangements for the last Annual Meeting, the defraying of reporting expenses from the financial proceeds so as to leave all $439 of registration fees for other purposes of the Association, and the further payment of $250 proceeds into the general treasury.

It was voted that the regular price of the Year Book be changed to $3.50 postpaid, but that to members, including corporate, the price of extra copies for their own use be $2.50 each, postpaid. The same reduced price was made to libraries of public institutions, and to students presenting orders endorsed by their chemistry or dyeing department heads.

It was voted that dues submitted with a membership application shall entitle the elected member to all numbers of the AMERICAN DYESTUFF REPORTER issued subsequent to submission of the dues, in the fiscal year covered by them; and that dues submitted with applications subsequent to January 1st shall entitle the member, upon his request, to back numbers from the first in January.

It was voted that on each application for transfer from other membership classification to Active, two signatures of other members be required, certifying the applicant's qualification for Active membership.

Sandoz Chemical Works, Inc., and Colloids, Inc., were declared elected to Corporate membership on December 7. The Procter & Gamble Co. was elected at this meeting.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided that no objection be received before that date by the Secretary:

Active

Chester W. Allinson, Lyman Billings, William W. Bray, Henry N. Bresette, Dale S. Chamberlin, Joseph H. Collins, James P. Colonel, Hal W. Field, Harry Gardner, Ehrhart Franz, Arno F. Haas, William Joseph Hannan, Alfred Newton Henschel, Frank C. Kelley, Harry K. Kerr, Victor Lawrence, Emil C. LeBeau, Albert Paul March, Nelson F. Mellin, Richardson B. Okie, Edward O. Ottney, Charles J. Sala, Theodore W. Sill, Thomas M. Sullivan, Henry Valus, Roland Williams, Hans Wolf, William A. Wolhar, George H. Wood, Jr.

Junior

Gustave E. Friedrichs, George H. Hotte, Clement J. Koeferl, Stephen E. Korpanty, Robert M. Oberholtzer, William Edward Smith, Frederick V. Traut, Harry W. Watson.

Associate

Charles H. Clark, Will H. Elbon, Kempton Harrison, H. E. Kiefer, Jr., David C. Scott, Al. H. Seitz.

Student

G. F. Bohorfoush, W. L. Dixon, Jr., J. R. Hill, R. G. Schwarz.

James J. Fanale, Ira S. Hurd, and John R. Roscow were transferred from Junior to Active membership.

Thanks for use of the rooms, and a Year Book, were voted to the Providence Engineering Society.

It was voted that the next Council meeting be in New York on March 1st, and that Washington be the place of the next following, on date to be set later.

Respectfully submitted,

HAROLD C. CHAPIN,
Secretary

Treasurer's Report—January 24, 1935

General Fund

Cash on hand, Nov. 1, 1934		$7.139.63
Receipts, Nov. 1, 1934, to Jan. 24, 1935:		
From H. C. Chapin, Secretary	$5,845.92	
Interest on savings	30.44	
		5,876.36
		$13,015.99
Expenditures, Nov. 1, 1934, to Jan. 24, 1935		2,489.81
Balance, Jan. 24, 1935		$10,526.18

Research Fund

Cash on hand, Nov. 1, 1934		$1,496.59
Receipts, Nov. 1, 1934, to Jan. 24, 1935:		
From H. C. Chapin, Secretary	$1,274.00	
Textile Foundation	2,025.00	
		3,299.00
		$4,795.59
Expenditures, Nov. 1, 1934, to Jan. 24, 1935		1,452.27
Balance, Jan. 24, 1935		$3,343.32

Secretary's Balance Sheet—January 23, 1935

	Applications	Dues, Regular & Re-instate.	Dues, Extra Sustaining & Contributions	Dues Corporate	Miscellaneous	Check tax & Collect. Charges	Total Net
Received by Secretary to Dec. 6, 1934	$197.50	$2,818.95	$145.00	$1,300.00	$58.03	$.52	$4,518.96
Received by Sec'y, Dec. 6, 1934, to Jan. 23, 1935	205.00	1,546.05	75.00	250.00	756.24*	.78	2,831.51
Total receipts from Nov. 1, 1934	402.50	4,365.00	220.00	1,550.00	814.27	1.30	7,350.47
Transmitted to Treasurer	352.50	3,810.00	195.00	1,550.00	798.19	1.30	6,704.39
Leaving to order of Secretary in Appleton Bank of Lowell	50.00	555.00	25.00		16.08		646.08

***Miscellaneous Recipts, Dec. 6, 1934, to Jan. 23, 1935**

Analytical methods	$5.46
DYESTUFF REPORTER	.56
Knitted tubing	4.08
Launderometers	24.00
Silk standards	1.00
Year Books	32.14
Annual Meeting, Registrations	439.00
Profits, from New York Section	250.00
Total	$756.24

Balance in Bank—January 24, 1935

General Fund	$10,526.18
Research Fund	3,343.32
Total	$13,869.50
First National Bank of Boston—Time Deposit Account	$5,000.00
First National Bank of Boston—Checking Account	8,869.50
	$13,869.50

Respectfully submitted,

W. R. MOORHOUSE,
Treasurer

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James M. Pike—Alabama Polytechnic Institute. Sponsor: C. B. Ordway.

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A TEXTILE PROCESSING SHOW

THE idea has been advanced, and it seems to be sound, that it might be logical and profitable to hold an annual exhibition of machinery, dyes and textile chemicals of interest to persons engaged in the wet processing of textiles. Other industries, and other branches of the textile industry, have held and continue to hold such exhibitions which have proved advantageous to all concerned.

We must realize, however, that it would be extremely foolhardy to attempt such a show unless the cooperation of some association and prospective exhibitors were assured. A show without sufficient exhibitors to make it attractive and worthwhile or without the "tie-up" with a strong and active association would be of little value to anyone concerned. The proper association for this is of course, the American Association of Textile Chemists and Colorists, being devoted as it is to all phases of wet processing of textiles. Such an exhibition with the cooperation of the A.A.T.C.C. would, we believe, prove of mutual benefit to those who have machinery and material to sell, to those who buy and to the Association itself.

We think it particularly important for the Association to cooperate for several reasons. First, it seems the natural and logical procedure; secondly, it will add the necessary prestige to such an undertaking; and thirdly, if such an exhibition were held in conjunction with the Annual Meeting and Convention of the Association, the double attraction would tend to increase the attendance both at the Annual Meeting and the suggested Textile Processing Show.

In this connection we might mention the Knitting Arts Exhibition held each year in Philadelphia under the auspices of the National Association of Hosiery Manufacturers. This show has continued through many years and has been reported to show a handsome profit to the hosiery manufacturers' association. This particular exhibition lasts for a week and the meetings of the association are held during that time. We can see no reason why a Textile Processing Show could not be held under the same conditions, winding up the week as it were, with the Annual Meeting of the A.A.T.C.C. Of course, the profits accruing the first year might not be very large but if it were possible to just pay expenses we should consider the venture worthwhile. Over a period of years we are under the impression that an annual processing show would be the source of a sizeable income.

An objection has been raised to the effect that inasmuch as the Annual Meeting is held in a different locality each year, the facilities some years for holding an exhibition of this type might be limited. However we doubt very much but what any city selected for the holding of the Annual Meeting would be able to offer suitable accommodations. We believe that holding such an exhibition in a different section of the country from year to year would increase its value rather than affect it adversely.

The expense of such an exhibit would have to be borne by those who would show their wares but we think the sales advantages offered the exhibitors would more than offset the cost involved. The proposed exposition would afford a splendid opportunity for the sellers to contact a large percentage of the buyers at one time under ideal conditions. At the same time it would give the buyers an excellent opportunity to see and compare all products under similar conditions.

Inasmuch as the next Annual Meeting of the A.A.T.C.C. will probably be held in Chattanooga, the possibility arises of the first Textile Processing Show being held in that place. Most of the larger business houses maintain southern branches and would be in a good position to exhibit their products. To those firms who do not maintain a southern outlet an opportunity would present itself to make worthwhile contacts in that locality.

This undertaking warrants the consideration of all concerned; the seller, the buyer and the Association. We want the buyers to let us know what they think of the idea and if it will be of sufficient importance to them to make their attendance desirable; we want the sellers to inform us as to their reactions, i.e., if the plan has sufficient merit for them to go to the necessary expense of providing an exhibit, and we want to know if the A.A.T.C.C. is willing to cooperate in the promotion of a Textile Processing Show.

Technical Notes from Foreign Sources

Use of Infra-Red Rays in the Textile Industry

Monats. F. Textil-Ind. 48, 156 (1933)—A review of an atricle in the "Wool Record and Textile World," 43, No. 1247 (1933)—(we cannot trace this periodical).

It is only a few years past that the sensitizing of photographic emulsions has reached such a stage of development that plates and films are now available which are sensitive to the infra-red (invisible red) rays; specially sensitive, that is, for the old ortho, and to some extent even the old non-color sensitive emulsions were sensitive to the red, to some extent. Readers are familiar with the remarkable ability of the new emulsions to cut through aerial haze, so that clear photographs may be taken of landscapes hundreds of miles away, when the landscapes themselves are totally invisible for more than a few miles, on account of moisture-haze in the atmosphere; and familiar too with the possibility of photographing of objects in total darkness, "illuminated" by invisible red, even heat rays. The most recent application of such emulsions is in the examination and evaluation of dyeings upon fabrics.

One line pursued consists in the photographing of dyed goods. There are certain defects which are not visible to the eye, and may not become visible even under ultra-violet radiation, a means of examination still comparatively recent and astonishing. One such case, to give an illustration, was presented by a piece of woolen goods dyed a dark navy-blue; the color bled from the dyed area into the adjacent white parts, though the dyeing appeared perfectly level and uniform to the eye. Photographs taken upon the new infra-red sensitive plates showed localities of lighter stripes in the weave, at regular intervals, which indicated that different lots of wool had been used in weaving. The defect, it is true, could have been detected by careful tests for fastness in the laboratory, but they would have consumed much time; but the infra-red photographs showed the source of the difficulty in a much shorter time and much more strikingly.

The second valuable possibility of the new emulsions lies in their use in examining dyeings, not for faults, but to determine the attitude, so to say, of the dyestuffs used toward the red radiation in sunlight; i.e., whether or not a dark dyeing will absorb the red radiation, which amounts to saying, the heat-rays, from sunlight, or will rather reflect such part of the sun's radiation. Dyestuffs which give dark tones, if they reflect the heat-rays, should be cooler for summer wear, as compared to a dyeing, on the same weave, made with a dyestuff which absorbs the heat-rays. In photographing such dyeings for comparison, when the proper exposure in the camera has been determined, if the same exposure is given in photographing each sample, the cooler dyestuffs reflecting the red rays, will photograph dark; the warmer dyestuffs, absorbing the red rays, will reflect less of the radiation back upon the photographic plate, and the negative will be light in tone. All this, of course, is true only for the short wavelengths, which are the heat-rays, as the expression is commonly used. Dry plates, cut film, illuminants, and exactly determined conditions for development are now available; the only factor left is the derivation of the proper photographic exposure, which in any case would have to be determined experimentally. None of the above differences would be visible by ocular inspection.

Cunliffe has recently studied a large number of dyed materials, in piece and yarn, by this method, and has recorded interesting results. Undyed serge is essentially non-absorbent to the rays in question, and in his tables has been classified as No. 1—very cool. Deep indigo dyeings he classifies as No. 4—very warm—the dyeings absorb most of the infra-red rays, make little impression upon the photographic plate, and when worn in garments absorb and retain the heat. Serge dyed with 4% of neutral Blue B he classifies as No. 2.

One case in which the method should have proved itself useful is in the examination of weaves composed of different lots of yarn, even, further, dyed differently, but appearing identical in the weave; ultra-violet examination will disclose these differences in the weave, while the infra-red method fails entirely. Another case, however, may be cited, involving after-treatment of dyeings upon wool, where the after-treatment was not even in its effect. Again, such dyeings appear uniform to the eye, but infra-red examination brings the situation to light at once.

Most yellow dyestuffs seem to reflect the heat-rays as much as the undyed fabric. Scarlets and many other reds behave in the same way. The violet dyestuffs vary very greatly in behavior, according to their class; some of them, even those which dye in light tones, absorb the infra-red rays almost completely. Of the greens, the fast ones are better than the less fast for coolness. The blues vary very greatly in their behavior; many, which dye easily and are not fast, absorb the red rays, while the fast dyestuffs comprise many which reflect the rays almost completely. The fast blues and blacks, especially the chromed or afterchroming ones, usually absorb most of the red rays; some acid blacks or blues, especially mixed tones, reflect the red rays very considerably; and the same is generally true of those colors even when dyed in bright tones.

Tris-Azo Dyestuffs

German Patent No. 478,045 (18/VI/'29) (*addition to G. P. No.* 450,998 of 14/VI/'24)—*I. G. Farben-Ind. A.-G.*—The original patent and two additional ones, Nos.

453,133 and 476,080, covered the production of tris-azo dyestuffs. The present addition specifies an extension, consisting in the diazotization of secondary dis-azo dyestuffs containing 1-amino-2-naphthol ethers at one end (the etherification of the naphthol hydroxyl avoids the conversion of the 1-amino-2-hydroxyl grouping to a 1-2-quinone), and coupling to gamma acid or its derivatives, in the presence of pyridine or similar compounds. The point of the procedure appears to lie in the use of pyridine to neutralize the HCl set free in the coupling, which is often difficult with complicated molecules because of the difficulty of neutralizing the HCl without establishing a reaction depressive to the coupling, which is slow and sensitive at best in such cases.

One example is given. The product dyes cotton a clear, greenish blue, of good fastness.

Azo Dyestuffs

German Patent No. 477,912 (15/VI/'29)—*I. G. Farben-Ind. A.-G.*—The point of this patent lies in the use, as second components, of such substances as possess, beside a free hydroxyl or amino group permitting coupling to take place para or ortho to it, an amino group substituted by a fatty acid carrying in the chain an aryl-ether group. The products are very fast to fulling and light and dye very level; and are useful also for discharge printing upon wool.

Three examples are given.

Azo Dyestuffs (Naphthol AS Series)

German Patent No. 470,178 (7/I/'29)—*I. G. Farben-Ind. A.-G.*—German Patent No. 421,205 proposed to increase the fastness of Naphthol AS dyeings by substituting a methyl group ortho to the NH residue in the arylides of 2-hydroxy-3-naphthoic acid. The present patent modifies this proposal by prescribing the use of such amines, in preparing the anilides, as contain aryl- or aralkyl-ether groups in the ortho position. The coupling, are of still greater fastness than the earlier products, especially to kier-boiling.

Two examples are given. The dyeings are in the red-blue-violet-black range.

Vat Dyestuffs (Anthraquinone Series)

German Patent No. 470,809 (29/I/'29)—*I. G. Farben-Ind. A.-G.*—Anthraquinone derivatives containing one or more amino groups in the beta position, or these amino groups substituted by a single radical each, so as to leave one reactive amino-hydrogen free, are reduced, and the leuco-derivatives converted to the 9-10-disulfuric acid esters, or their salts. These substances are subjected to mild oxidation in the presence of alkali, and the resultant compounds then oxidized in acid solution. The products are azines of anthraquinone, many of them new, according to the complexity of substitution of the original material.

Three examples are given. The products are of great fastness.

Peri Dis-Azo Dyestuffs

P. Ruggli and A. Courtin—Helv. Chim. Acta 15, 113 (1932).—The 1-8-naphthylene-diamines cannot well be successfully tetrazotized, as the nitrous acid reacts in such cases in a characteristic way, producing azo-imides (cyclic amino-azo compounds). To attain couplings of the nature mentioned, the other possible way consists in using 2-7-dihydroxy-naphthalene (or 2-hydroxy-7-amino-naphthalene or 2-7-naphthylene-diamine) as the second component, and coupling to it two molecules of a diazotized amine, the coupling then taking place normally in the 1-8 position (peri position). The couplings produced with two molecules of diazotized naphthionic acid to one of 2-7-dihydroxy-naphthalene is a brown dis-azo dyestuff, the constitution of which has been established by reduction with stannous chloride in the presence of formic acid, 1-8-Diamino-2-7-dihydroxy-naphthalene is formed in this way (as well as the regenerated naphthionic acid), and this was condensed to 2-7-dihydroxy-1-8-perimidine.

The dis-azo dyestuff does not dye cotton directly, and its dyeings with wool vary according to the conditions of dyeing; if the dyestuff is dissolved in cold water, acidified, the wool entered, and the bath brought to the boil, the wool is dyed a reddish brown, the same color as that of the dyestuff in substance. But, if the dyestuff is dissolved in hot water, the solution is blue; and if the hot solution is acidified, the wool entered, and the bath boiled, the wool is dyed a violet, brown, or black, according to conditions. The reason for this change in color is not as yet clear; it may be due to an oxidation to a quinhydrone, or a conversion to a cyclic derivative, an oxyperimidine quinone.

Ortho Dis-Azo Dyestuffs

P. Ruggli and A. Courtin—Helv. Chim. Acta 15, 75 (1932).—The authors have carried out work on ortho dis-azo couplings, similarly to the methods employed in the preceding article, but in this case using benzene derivatives instead of naphthalene compounds. They have prepared various dis-azo couplings with o-amino-azotoluene and its sulfonic acids, with a naphthalene derivative as second component. Such compounds as they have synthesized contain auxochrome groups, and according to studies of their absorption-spectra are true dis-azo compounds.

The authors, in their study, have also formed certain compounds by the reaction of phenyl-hydrazine and sodium bisulfite, and by condensing ortho-amino-azo compounds with nitroso-benzene, in the hope of producing dis-azo compounds, but the substances thus obtained seem to possess no auxochrome groups, and to be similar in structure.

Tris-Azo Dyestuffs

German Patent No. 476,080 (6/V/'29) (*addition to G. P. No.* 450,998 *of* 14/VI/'24)—*I. G. Farben-Ind. A.-G.*—The original patent covered the coupling of diazotized secondary dis-azo dyestuffs, containing a free amino-group, the end component being 1-amino-2-naphthol-ether-6-sulfonic acid, to J-acid and certain other easily-coupling derivatives of it, in the presence of pyridine. The present addition extends the process to other derivatives of J-acid, which ordinarily can be coupled to with great difficulty, or not at all. Such derivatives are, for example, 2-alkyl-amino-, 2-aralkyl-amino-, 2-aryl-amino-5-naphthol-7-sulfonic acids or their substitution products, 2-carbonyl-amino-5-naphthol - 7 - sulfonic acid, 5 - 5'-dihydroxy-2-2'-dinaphthylamine-7-7'-disulfonic acid, m- or p-aminophenyl-1-2-naphthimidoazol-5-naphthol-7-sulfonic acid, m- or p-aminophenyl-1-2-naphthothiazole-5-naphthol-7-sulfonic acids, these and such resulting compounds coupling with the characteristically unstable diazo-salts of the secondary dis-azo dyestuffs considered, with very astonishing ease and smoothness in the presence of pyridine, whose action must be suspected to be not only that of a neutralizing agent for the HCl split out in the coupling, but that of a catalyst promoting rapid coupling, and possibly that of a stabilizer of the labile diazo-salts in the mixture.

The products obtained by the three examples given are specially suitable for diazotizing and developing further after being dyed upon the fiber. The tones produced (a considerable range) are distinguished by great purity.

• WOOL PROMOTION

As a result of eleven months investigation and experimentation, a report covering the findings and recommendations of a Joint Industry Committee is being distributed to every concern in the Wool Industry. This work was initiated separately by a Sales Promotion Committee of the National Association of Wool Manufacturers, and a Publicity Committee of the National Wool Trade Association. After considerable study and active field work these committees turned over their data and recommendations to a Joint Committee representing the two Associations mentioned and, in addition, the National Wool Growers Association. The report of this body is being issued in graphic form by means of charts and illustrations, accompanied by very brief explanatory text.

The complete report is being mailed out to all of the wool manufacturers and the wool dealers by their respective associations and is, as well, being presented personally at various group meetings. In addition, Mr. Arthur Besse, Chairman of the Joint Committee made a personal presentation of the report at the National Wool Growers Association at Phoenix, Arizona, on January 30th.

• ENGLISH CHEMICALS AND DYES

The chemical industry continued to expand in England during the closing months of 1934 though there was a gradual decrease in activity as the holiday season approached, according to a report from Vice Consul Myles Standish, Manchester, made public by the Commerce Department's Chemical Division.

Prices, with few minor exceptions, remained firm throughout the last quarter though demand was somewhat sluggish, particularly in the heavy chemical field. Dyestuffs, generally speaking, were in better demand than industrial chemicals.

As far as can be ascertained from available statistics English production of chemicals including dyestuffs during the last three months of the year remained constant in comparison with the third quarter but was about 2 percent higher than for the first three months of 1934, the report states.

Generally speaking, the English chemical industry was in a strong position at the end of the year, better perhaps than any other of the country, the Vice Consul reported. The great variety of products and their uses, together with an increasing number of openings in new fields, have kept prices and production levels of chemicals more regular than in most other industries, it is pointed out.

The bulk of chemicals and dyestuffs produced in England during the last three months of the year were absorbed by the domestic market, although export demand was good. During the three-month period exports of heavy chemicals, pharmaceuticals, and dyes and dyestuffs were valued at £4,171,175, an increase of 9 percent over the third quarter.

Exports of these products during the whole of 1934 totalled £9,722,800, compared with £8,529,218, for the preceding year, the report states.

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POSITION WANTED—Dyestuff Salesman well known in the southern territory, has following in Dyeing and Printing, thorough knowledge of the application of color. Age 38 years. Would consider mill connection, eight years selling Dyestuffs and Chemicals, seven years practical mill experience. Best of references. Address Box No. 847, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.